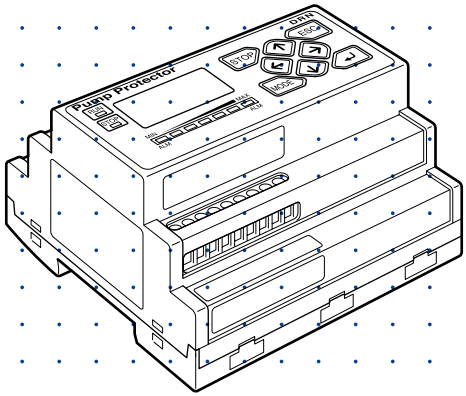
Iwaki Pump Protector
DRN series



Instruction manual

Thank you for choosing our product.

Please read through this instruction manual before use.

This instruction manual describes important precautions and instructions for the product. Always keep it on hand for quick reference.

Veuillez lire attentivement ce mode d'emploi avant toute utilisation.

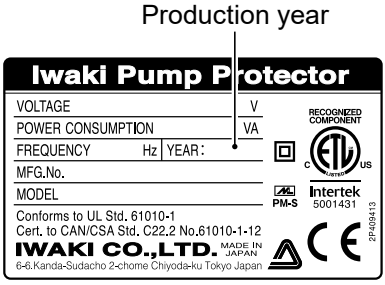
Ce manuel d'instructions décrit les précautions et instructions importantes pour le produit. Gardez-le toujours à portée de main pour consultation rapide.

Order confirmation

Open the package and check that the product conforms to your order. If any problem or inconsistency is found, immediately contact your distributor.

a. Check if the delivery is correct.

Check the nameplate to see if the information such as model codes, power voltage and power consumption are as ordered.



b. Check accessories are complete.

- *3m extension cable ×1*
- *JS10FL current sensor ×1 (DRN-01) or JS24FL current sensor ×1 (DRN-02)*
- *This instruction manual ×1*
- *Mode transition diagram ×1*

c. Check if the delivery is damaged or deformed.

Check for transit damage and loose bolts.

Contents

Safety instructions / Consignes de sécurité

Read through this section before use. This section describes important information for you to prevent personal injury or property damage.

Veuillez lire attentivement cette section avant toute utilisation. Elle fournit d'importantes informations visant à empêcher toute blessure corporelle ou tout dommage matériel.

■ Symbols / Symboles

In this instruction manual, the degree of risk caused by incorrect use is noted with the following symbols. Please pay attention to the information associated with the symbols.

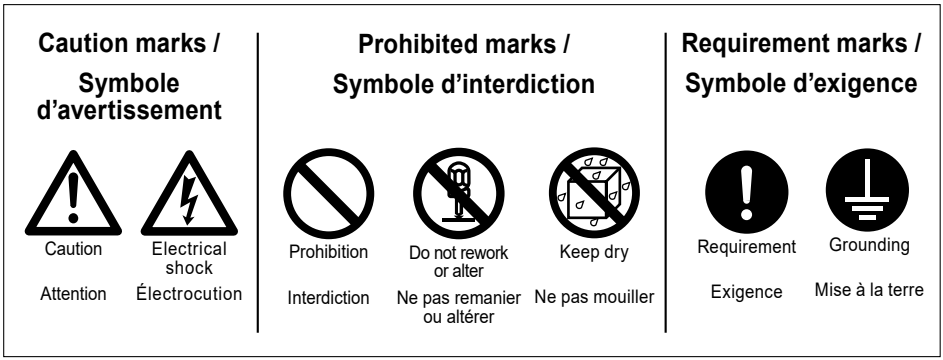
Dans le présent manuel d'instructions, le degré de risque lié à une utilisation incorrecte de l'équipement est indiqué par les symboles suivants. Veuillez prêter attention aux informations associées à chaque symbole.

⚠ **WARNING**	Indicates mishandling could lead to a fatal or serious accident.
⚠ **AVERTISSEMENT**	Indique que toute erreur de manipulation peut conduire à un accident grave ou entraînant la mort.

⚠ **CAUTION**	Indicates mishandling could lead to personal injury or property damage.
⚠ **ATTENTION**	Indique que toute erreur de manipulation peut conduire à des blessures corporelles ou à des dommages matériels.

A symbol accompanies each precaution, suggesting the use of "Caution", "Prohibited actions" or specific "Requirements".

Chaque mesure de sécurité est accompagnée d'un symbole, qui indique un "Avertissement", des "Actions interdites" ou une "Exigence" particulière.



⚠ Export Restrictions / Restrictions à l'exportation

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control.
Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

Les informations techniques contenues dans le présent manuel d'instructions peuvent être considérées dans vos pays comme une technologie contrôlée, en raison d'accords dans le cadre du régime international pour le contrôle des exportations.
Veuillez garder à l'esprit qu'un permis/une licence d'exportation peut être nécessaire pour la fourniture du présent manuel d'instructions, en raison de la réglementation relative au contrôle des exportations de votre pays.

⚠WARNING / AVERTISSEMENT

Turn off power before service

Risk of electrical shock. Be sure to turn off power to stop the protector and related devices before service is performed.

Electrical shock

Électrocution

Avant toute procédure d'entretien, mettre la pompe hors tension

Risque d'électrocution. Avant tout entretien, veillez à couper l'alimentation pour mettre le dispositif de protection et les dispositifs associés hors tension.

Stop operation

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.

Requirement

Exigence

Interrompre le fonctionnement de l'équipement

Si vous remarquez une anomalie ou un danger, interrompez immédiatement le fonctionnement de l'appareil et réalisez un examen ou résolvez les problèmes.

Do not use the product in any condition other than its intended purpose

The use of this product in any conditions other than those clearly specified may result in failure or injury. Use this product in specified conditions only.

Prohibition

Interdiction

Ne jamais utiliser le produit à d'autres fins que celles prévues

L'utilisation de ce produit à d'autres fins que celles clairement définies risque d'entraîner une défaillance ou une blessure corporelle. N'utilisez ce produit qu'aux fins prévues.

Do not modify the protector

Alterations to this product carries a high degree of risk. It is not the manufacturer's responsibility for any failure or injury resulting from alterations to the protector.

Do not rework or alter

Ne pas remanier ou altérer

Ne pas apporter de modification au dispositif de protection

Toute altération de ce produit présente un degré de risque élevé. Le fabricant ne peut être tenu responsable de toute défaillance ou blessure corporelle résultant d'une altération du dispositif de protection.

Do not damage the power cable

Do not pull, knot, or crush the power cable. Damage to the power cable could lead to a fire or electrical shock if cut or broken.

Prohibition
Interdiction

Ne pas endommager le câble d'alimentation

Ne tirez pas et ne faites pas de nœud sur le câble d'alimentation, et veillez à ce qu'il ne soit pas écrasé. S'il est endommagé, le câble d'alimentation risque de se couper ou se briser, ce qui peut entraîner un incendie ou une électrocution.

Installation of the motor power current sensor

Risk of fire. Observe this instruction manual when the JS10FL or JS24FL motor power current sensor is electrically connected. Unauthorized procedure could rise the sensor temperature high and could eventually lead to fire.

Requirement
Exigence

Installation du capteur de courant d'alimentation du moteur

Risque d'incendie. Tenez compte de ce manuel d'instructions lorsque le capteur de courant d'alimentation du moteur JS10FL ou JS24FL est connecté électriquement. Une procédure non autorisée peut amener le capteur à une température élevée et peut finalement conduire à un incendie.

⚠ CAUTION / ATTENTION

Qualified personnel only
This product should be handled or operated by qualified personnel with a full understanding of the protector. Any person not familiar with the product should not take part in the operation or maintenance of the protector.


Requirement
Exigence

Faire appel à du personnel qualifié uniquement
La manipulation ou l'utilisation de ce produit doit être confiée à du personnel qualifié et doté d'une connaissance parfaite du dispositif de protection. Toute personne qui n'est pas dotée d'une connaissance parfaite du produit ne doit pas participer à l'utilisation ou à la maintenance du dispositif de protection.

Use specified power only
Do not apply power other than that specified on the nameplate. Otherwise, failure or fire may result. Ensure the pump is properly grounded.


Requirement
Exigence

Toujours utiliser la pompe à sa puissance nominale
N'utilisez aucune source d'alimentation qui ne respecte pas la puissance nominale indiquée sur la plaque signalétique. Cela risque d'entraîner une défaillance ou un incendie. Vérifiez que la mise à la terre de la pompe a été réalisée correctement.

Do not use a damaged protector
Use of a damaged protector could lead to an electric shock or death.


Prohibition
Interdiction

Ne jamais utiliser un dispositif de protection endommagé
L'utilisation d'un dispositif de protection endommagé risque d'entraîner une électrocution ou la mort.

Grounding
Risk of electrical shock! Always properly ground the protector. Conform to local electric codes.


Grounding
Mise à la terre

Mise à la terre
Risque d'électrocution! Réalisez toujours la mise à la terre du dispositif de protection de manière adaptée. Veillez à vous conformer aux codes de l'électricité locaux.

Do not use the protector in a wet location

The protector is not waterproof. Use of the protector in wet or extremely humid locations could lead to electric shock or short circuit.

Keep dry
Ne pas mouiller

Ne pas utiliser le dispositif de protection dans un endroit humide

Le dispositif de protection n'est pas étanche. Son utilisation dans un endroit mouillé ou extrêmement humide risque d'entraîner une électrocution ou un court-circuit.

Install a GFCI (earth leakage breaker)

An electrical failure of this product may adversely affect other devices on the same line. Purchase and install a GFCI (earth leakage breaker) separately.

Electrical shock
Électrocution

Installer un disjoncteur-détecteur de fuites à la terre (GFCI)

Toute défaillance électrique de ce produit risque de nuire aux autres dispositifs présents sur la même ligne. Procurez-vous et installez un disjoncteur-détecteur de fuites à la terre (GFCI) séparément.

Do not install/store the pump:

–In a flammable/explosive/corrosive atmosphere.
–In a dusty/humid environment.
–Where ambient temperature can exceed 0-40°C (32-104°F).
–In direct sunlight or wind & rain.
–In mechanical vibration.

Prohibition
Interdiction

Ne pas installer/stocker la pompe:

– Dans une atmosphère inflammable/explosive/corrosive.
– Dans un environnement poussiéreux/humide.
– Dans un endroit où la température ambiante est susceptible de dépasser la plage de 0-40°C.
– Dans un endroit exposé directement à la lumière du soleil, au vent ou à la pluie.
– Dans un endroit exposé à des vibrations mécaniques.

Keep electric parts and wiring dry

Risk of fire or electric shock. Install this product where it can be kept dry.

Veiller à ce que les pièces et le câblage électriques restent secs

Risque d'incendie et d'électrocution. Installez ce produit dans un endroit où il ne risque pas d'être mouillé.

Disposal of a used protector

Dispose of any used or damaged protector in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company (in the DRN, a CR1632 built-in lithium bottom cell is used.).

Mise au rebut d'un dispositif de protection usagé

Mettez au rebut tout dispositif de protection usagé ou endommagé conformément aux réglementations locales. Consultez une société d'élimination des déchets industriels agréée si nécessaire (dans le DRN, une pile bouton au lithium intégrée CR1632 est utilisée).

Keep the spec label and nameplate clean

If labels and a nameplate has become unglued or illegible, contact us to replace them with new ones.

Veiller à ce que l'étiquette de spécifications et la plaque signalétique restent propres

Si les étiquettes et la plaque signalétique se décollent ou deviennent illisibles, contactez-nous pour leur remplacement par des étiquettes et une plaque signalétique neuves.

Precautions for use / Précautions d'utilisation

- Electrical work should be performed by a qualified electrician. Otherwise, personal injury or property damage could result.
- Toute procédure liée à l'installation électrique doit être confiée à un électricien qualifié. Dans le cas contraire, il existe un risque de blessure corporelle et de dommage matériel.


Caution
Attention

- Use care handling the protector. Do not drop. An impact may affect protector performance. Do not use a protector that has been damaged to avoid the risk of electrical damage or shock.
- Soyez prudent lorsque vous manipulez le dispositif de protection. Ne laissez pas échapper le dispositif de protection. Tout choc risque de nuire à la performance du dispositif de protection. Si un dispositif de protection a été endommagé, ne l'utilisez pas pour éviter tout risque de dommage électrique ou d'électrocution.


Caution
Attention

- Do not clean the protector or nameplate with a solvent such as benzine or thinner. This may discolor the protector or erase printing. Use a dry or damp cloth or a neutral detergent.
- Ne nettoyez pas le dispositif de protection ni la plaque signalétique à l'aide d'un solvant comme du benzine ou du diluant. Cela risque de décolorer le dispositif de protection ou d'effacer des données inscrites dessus. Utilisez un chiffon sec ou humide, ou un détergent neutre.


Caution
Attention

- If the 20 year-life internal battery went dead, the internal clock will be disabled. In this case the clock-based event logs will be no longer available. Contact us for the battery replacement.
- Si la batterie interne d'une durée de vie de 20 ans s'arrête de fonctionner, l'horloge interne sera désactivée. Dans ce cas, les journaux d'événements basés sur l'horloge ne seront plus disponibles. Contactez-nous pour le remplacement de la batterie.


Caution
Attention

- The DRN checks the user database (user setting of the DRN parameters) every time the power is turned on. If an out-of-range setting is found in the database, the "SYSTEM ERROR" message will show up.
- Le DRN vérifie la base de données de l'utilisateur (réglages de l'utilisateur des paramètres du DRN) à chaque mise sous tension. Si un réglage hors plage est trouvé dans la base de données, le message « ERREUR DU SYSTEME » apparaîtra.


Caution
Attention

- When the DRN suspends the motor operation as it got an alarming signal, and if the protector has lost the power while keeping the motor stopped, in such a case, be noted the pump will starts running as the DRN regains the power.
- Lorsque le DRN interrompt le fonctionnement du moteur car il a reçu un signal d'alarme, et si le dispositif de protection a cessé d'être alimenté pendant qu'il maintenait le moteur à l'arrêt, notez que la pompe commencera alors à fonctionner tandis que le DRN recommencera à être alimenté.


Caution
Attention

- If this product may not work properly when it is used to a pump with an inverter motor.
- Ce produit peut ne pas fonctionner correctement lorsqu'il est utilisé pour une pompe avec un moteur à convertisseur.


Caution
Attention

Overview

Product characteristics, features and part names are described in this section.

Introduction

Operating principle

An Iwaki DRN series pump protector monitors the parameters of the motor power current, the discharge pressure of the pump, a liquid/motor temperature, and any other parameter from the analog/digital inputs like a flow rate from a flow meter, and is used specially with Iwaki MX, MXM, SMX, MDM, MDE and MDW magnetic drive pumps with the 0.37kW - 75kW range motors.

Operational features

The DRN has diversified features as shown below.

■ Monitoring parameters

The DRN monitors the following parameters and shows readings of each active input on its screen. If any input readings have exceeded the upper limit or fallen below the lower limit, the DRN sends an alarm signal to an external device and stop the motor. Other monitoring parameters than the motor power current has been set disabled with the factory default setting. Electrically connect necessary inputs and set them enabled as needed.

Motor power current (CURR)

The DRN monitors the motor power current in the range of 0.50-30.00A with the JS10FL clamp current sensor or 5.0-200.0A with the JS24FL sensor.

*This parameter is always set enabled and can not be set disabled.

Discharge pressure (PRSS)

The DRN monitors the discharge line pressure with a 4-20mA or 1-5VDC analog output pressure sensor.

Analog current/voltage (ANA)

The DRN monitors the flow rate or any other factor with a 4-20mA or 1-5VDC analog output pressure sensor/flow meter or any other device.

Motor temperature (TEMP)

The DRN monitors a temperature of a motor, liquid or any other factor in the range of -50 - 200°C with a type K thermocouple or a Pt100 RTD.

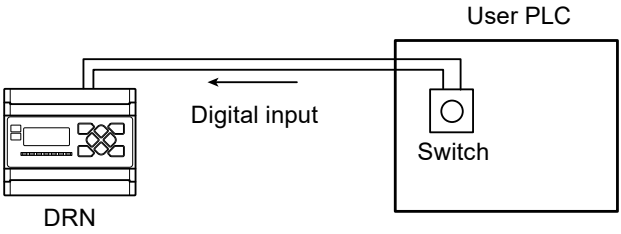
*Use of any other sensor type will not assure proper operation.

■ Dry contact digital input

The DRN can also control the pump operation in accordance with ON and OFF of the external dry contact digital signal which it receives. This digital input can be utilised for the external alarm reset, the 2-way setting shift, and the level sensor monitoring as shown below. These three ways of use are not available at the same time. Choose one of them which is most needed for your system through the configuration mode after dedicated wiring for it is properly established. None is selected in the factory default setting.

External alarm reset (EXT_RST)

As well as the direct keypad operation of the DRN, a remote input of the DIG (IN) signal (24th and 25th terminals) can restart the pump suspended in the alarm state. To enable this function, the "EXT_RST" option must be selected via the configuration mode in advance. See page 62 as well.



2-way setting shift (EVENT)

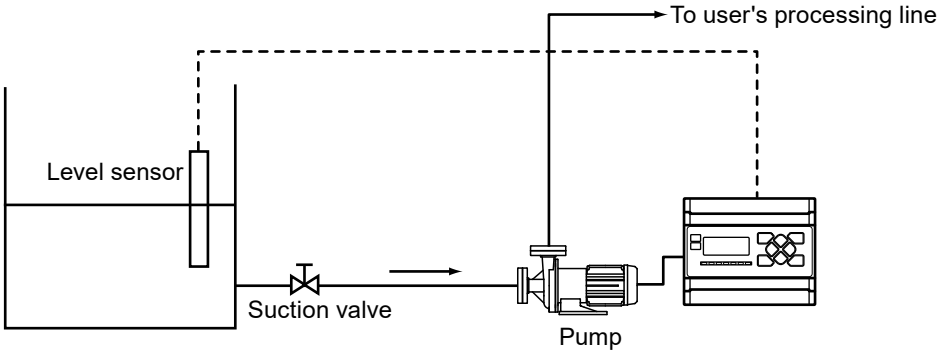
A remote input of the DIG (IN) signal (24th and 25th terminals) can shift the DRN between two different settings of the event 1 and 2. To enable this function, the "EVENT" option must be selected via the configuration mode in advance. The event 1 and 2 in any of the MANUAL, EASY, or AUTO control mode have their own upper and lower limits of the monitoring parameters and the start delay time. To shift between the event 1 and 2, choose the digital output logic of the "OPEN-ON" or "CLOSE-ON" via the configuration mode. See page 62 as well.

When "OPEN-ON" is selected in the CONFIG mode, the setting is in:
- Event 1 with closed circuit
- Event 2 with open circuit

When "CLOS-ON" is selected in the CONFIG mode, the setting is in:
- Event 1 with open circuit
- Event 2 with closed circuit

Level sensor (LV_SNSR)

A remote input of the DIG (IN) signal (24th and 25th terminals) from the level sensor stops the pump when the liquid level in the supply tank has reached the allowable lowest level for the prevention of the friction heat damage to the pump. To enable this function, the "LV_SNSR" option must be chosen in advance. See page 62 as well.



■ MANUAL/EASY/AUTO setting modes

The upper and lower limit setting to the monitoring parameters are made in different ways at each mode of the MANUAL, EASY and AUTO control. See page 51 as well.

In MANUAL setting mode:

The user must manually determine and enter the upper and lower limits of monitoring parameters to the DRN.

In EASY setting mode:

The user must run the pump at the allowable highest and lowest operating points to take the upper and lower limits into the DRN.

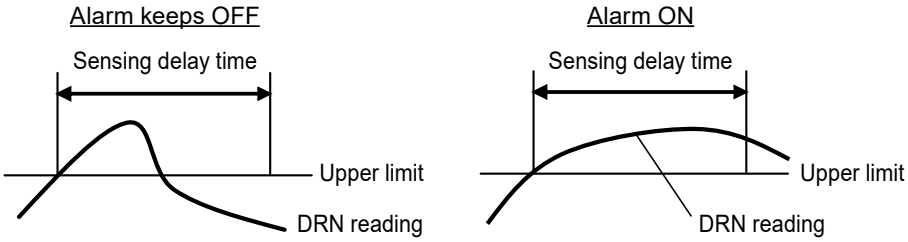
In AUTO setting mode:

The DRN determines the upper and lower limits of monitoring parameters automatically while the pump is running at the rated operating point.

■ Sensing delay time

The sensing delay time can be se at each monitoring parameter for the prevention of occurrence of frequent alarm ON/OFF. Even when one of the DRN readings of the motor power current, discharge line pressure, current/voltage analog signal input and temperature has exceeded an upper limit or fallen below a lower limit, the DRN will not activate the alarm unless this unpreferable condition continues over the preset delay time.

See the *"Upper/Lower limit and sensing delay time"* section on page 65.



■ Pre-Alarm

The DRN can send the pre-alarm signal via the relay output to the external device and indicate the warning message on the DRN screen before one of the DRN readings has exceeded an upper limit or fallen below a lower limit and the pump operation is suspended. See page 74 for detail.

■ Reading correction (motor power current)

The motor power current reading of the DRN can be adjusted to a reference ammeter. See the page 79 for the correction procedure.

■ Reading correction (temperature)

The DRN can adjust its temperature reading in the range of ±5ºC. See page 80 and adjust the DRN reading to the reference thermometer in advance.

■ Event logging

The DRN logs the state parameters shown below. These parameters can be checked by the event log view mode.

Alarm (ALARM)

The past 20 alarm states and times can be viewed back.

Maintenance time (MENTE)

The past 10 maintenance reminder intervals and the reminder confirmation days and times can be viewed back.

Accumulated operation times (RUM-TIM)

The accumulated operation time of the pump and the DRN ON time can be viewed.

Total number of relay ON times (RELAY)

The accumulated number of ON times of the MC relay and the alarm relay can be viewed.

Valid setting (SETTING)

The upper and lower limits and sensing delay times set to each monitoring parameter can be viewed.

Model identification (MODEL)

The model identification of your DRN can be viewed.

■ Maintenance reminder

The maintenance reminder of the DRN reminds you of the need for inspection and maintenance every time the maintenance interval has passed. See page 86 as well. Note that the best maintenance interval changes with operating conditions such as the pump type, piping system and liquid properties.

■ Cavitation detection

If a pressure sensor is used with the DRN to monitor the discharge line pressure, an appropriate judgement width can help the DRN to detect a sharp and a short frequency pressure fluctuation which often accompanies cavitation. See page 90.

■ Keypad lock

DRN keypads can be locked to prevent erroneous key operation. See page 92.

■ Initialization (monitoring parameters)

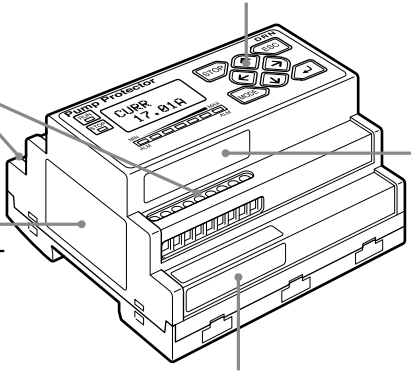
Once-configured parameters in the setting mode and the auxiliary features can be initialized with the factory presets. Settings in the configuration mode are not initialized and remain the same. See page 94 and later pages for the parameters to be initialized.

■ Factory defaulting (all settings)

The DRN can return all the parameters in the configuration and setting modes to the factory presets. See page 94 as well.

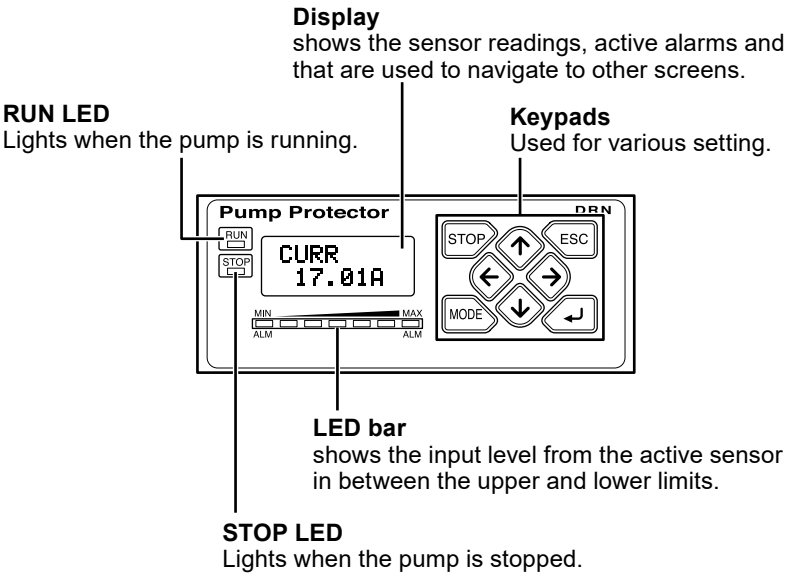
Protector

Remove the protective sheet from the operational panel before use.



Operational panel

The DRN has a display, a RUN /STOP LED, an LED bar and direction keys.



Identification codes

The model codes of the protector represent the following information.

DRN - 01

a b

a. Series name

DRN

b. Current measurement range

01: 0.50-30.00A (JS10FL current sensor)

02: 5.00-200.0A (JS24FL current sensor)

Installation

This section describes the installation of the protector and wiring. Read through this section in advance.

Observe the following points when installing the protector.

- Risk of electrical shock. Be sure to turn off power to stop this protector and related devices before service is performed.
- If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.
- Do not place explosive or flammable material near the protector.
- Do not use a damaged protector. Use of a damaged protector could lead to an electric shock or death.
- Use care handling the protector. Do not drop. An impact may affect protector performance.

Protector mounting

Before installation

Observe the following points to ensure good installation environment.

- This product doesn't have power switch and will be activated as the power is supplied. Be sure to provide a power switch for this product.
- For the prevention of malfunction by a conductive noise, do not share the same power source with an inductive load.
- Protect the protector against an electric noise including a conductive noise, induction noise and radiation noise. Use of a noise filter or a spark killer may be necessary, especially for a conductive noise, depending on environment.

Precautions

Observe the following points when installing the protector. Or the life time of the protector may shorten.

• Do not install the protector:
  –In a flammable/explosive/corrosive atmosphere.
  –In a dusty/humid place.
  –In direct sunlight or wind & rain.
  –In mechanical vibration
  –Where ambient temperature can exceed 0-40ºC (32-104ºC).
  –Where ambient humidity can exceed 35-85%RH.

• Allow sufficient space around the protector for easy access and maintenance.

• Contact us when the DRN is installed in a harsh conditions including a corrosive atmosphere or out of doors.

Installation

This DIN rail-mount protector is designed to be installed into your control panel or distribution switchboard via the 35mm width DIN rail.

NOTE

Make sure the DRN won't come off the DIN rail once it has been mounted.

■ DRN mounting

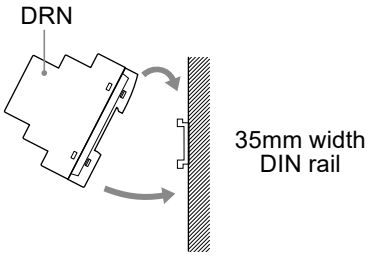
1 **Select a location**

Select a level location, free from vibration, that won't hold liquid. See page 15 as well.

2 **Mount the DRN on the DIN rail**

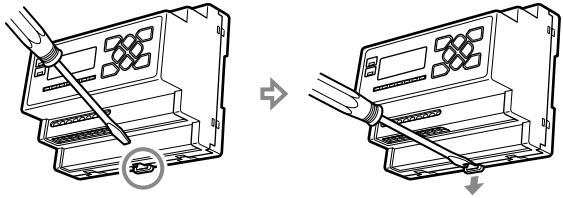
First catch the upper rail with the upper holder on the DRN back and then the lower rail with the lower holder until it clicks once.

*Keep the blank space around the DRN for the distance of 20 mm in both the horizontal and the vertical directions.



■ DRN demounting

1 **Pull the stopper back with the slotted screw driver**



2 **Unhook the DRN from the lower rail and then the upper rail**

Current sensor mounting

After the DRN is installed, attach either the JS10FL (0-30.00A) or JS24FL (0-200.0A) clamp current sensor according to the motor rated current, to any one of three motor power lines.

NOTE

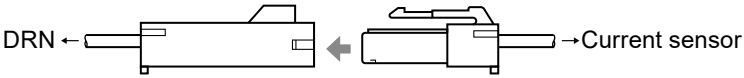
Risk of fire. Observe the mounting steps described below when the current sensor is electrically connected.

■ Sensor mounting

1 **Select the proper sensor size according to the motor power line O.D.**

Use the JS10FL to the ø10 motor power line or the JS24FL to the ø24 motor power line.

2 **Couple the female connector of the connection cable with the male connector of the clamp current sensor**



3 **Connect the other end of the connection cable to the DRN**

Connect the white wire to the 10th terminal of the DRN and the black wire to the 11th terminal.

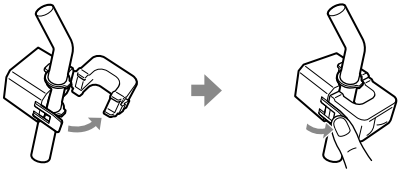
4 **Release the latch and open the clamp sensor**

5 **Select any one of the three motor power line**

Any line is ok. There is no mounting direction for the sensor to be mounted as well.

6 **Close the sensor until it "clicks" twice**

Accurate measurement will not be obtained. Make sure the power line is caught by the latch of the clamp sensor and won't move at all. Use a zip tie attached on the sensor sides if necessary.



■ **Sensor demounting**

1 **Release the latch and open the clamp sensor**

2 **Remove the power line from the clamp sensor**

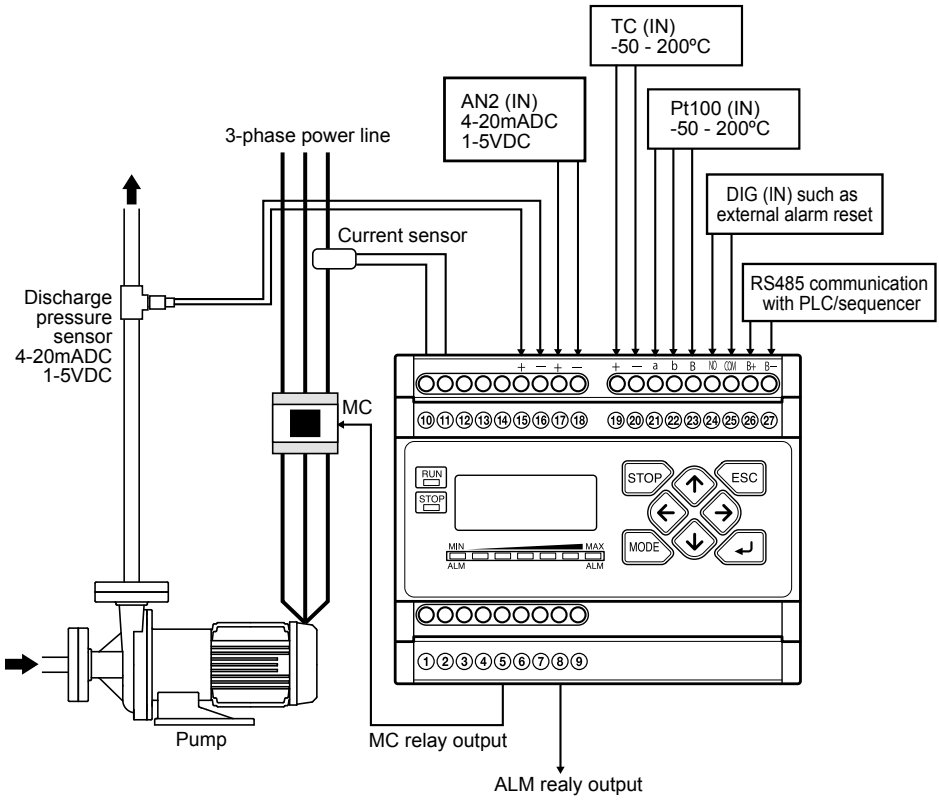
Wiring

Wiring for a power voltage, earthing and external signals.

! Observe the following points during wiring work.

- Electrical work should be performed by a qualified electrician. Always observe local electric codes.
- Do not perform wiring work while electric power is ON. Otherwise, an electrical shock or a short circuit may result. Be sure to turn off the power before wiring work.
- The protector is still charged right after turning off power. Wait for one minute before wiring.

■ End terminals



■ Pin assignment

Pin #	Assignment	Remarks
1		Frame ground
2	L	100-240VAC
3	N	
4	-	–
5	MC	MC relay output (NO)
6	MC	
7	ALM (NC)	Alarm relay output (CO)
8	ALM (NO)	
9	ALM (COM)	
10	CT (WT)	Motor power current input
11	CT (BK)	
12	N.C.	–
13	N.C.	–
14	N.C.	–

Pin #	Assignment	Remarks
15	AN1 (+)	4-20mA/1-5V pressure input
16	AN1 (-)	
17	AN2 (+)	4-20mA/1-5V analog input
18	AN2 (-)	
19	TC (+)	-50 - 200°C type K TC
20	TC (-)	
21	Pt100 (A)	 Pt100 RTD
22	Pt100 (b)	
23	Pt100 (B)	
24	DIG (NO)	Digital contact input
25	DIG (COM)	
26	RS485 (B+)	Communication
27	RS485 (A-)	

*Pay attention to polarity if an open collector output is used to the digital contact input terminals. The 24th DIG (NO) terminal is plus (+), and the 25th DIG (COM) terminal is minus (-).

*The MC contact (NO) closes when the power is ON and opens when the DRN enters an alarm mode.

■ Applicable lead wire size

Use 24-12AWG wires for the power voltage line, ground line and all the signal lines. Use the best suitable rod terminal according to the cable size.

Cable size	Phoenix Contact Parts number
0.25 mm^2	AI 0.25-8BU (3201364)
0.34 mm^2	AI 0.34-8TQ (3203066)
0.5 mm^2	AI 0.5-8WT (3200014)
0.75 mm^2	AI 0.75-8GY (3200881)
1.0 mm^2	AI 1-8RD (3200030)
1.5 mm^2	AI 1.5-8BK (3200043)

Signal wire connection

1 **Connect the signal wire properly to the terminal block of the DRN**

Strip the end of the signal wire about 6-7mm and use the slotted screw driver to fix it to the appropriate terminal pin of the DRN by 0.5-0.6N•m.

*Check that each wire is properly connected. Or malfunction may result.

Power voltage/Earthing

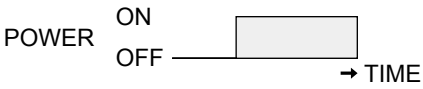
Check that the main power is turned off.

1 Connect the earth wire with the ground terminal of the DRN and link it with an earthing point

NOTE

- Do not share a power source with a high power device which may generate surge voltage. Otherwise an electronic circuit may fail. The noise caused by an inverter also affects the circuit.
- Energize the protector with the rated power voltage via a mechanical relay or switch with no voltage fluctuation, or CPU may not work properly.

Apply power sharply



Do not apply gradually

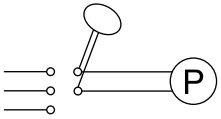
Surge voltage

The electronic circuit in this protector may fail due to surge voltage. Do not place this product close to a high power device of 200V or more which may generate large surge voltage. Otherwise, take any of the following measures.

- Install a surge absorption element (ex. a varistor with capacity of 2000A or more) via power cable.

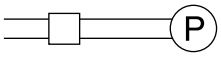
  Recommended varistors:
  Panasonic ERZV14D431
  KOA NVD14UCD430
  See manufacturer's catalogues for detail.

Surge absorption element

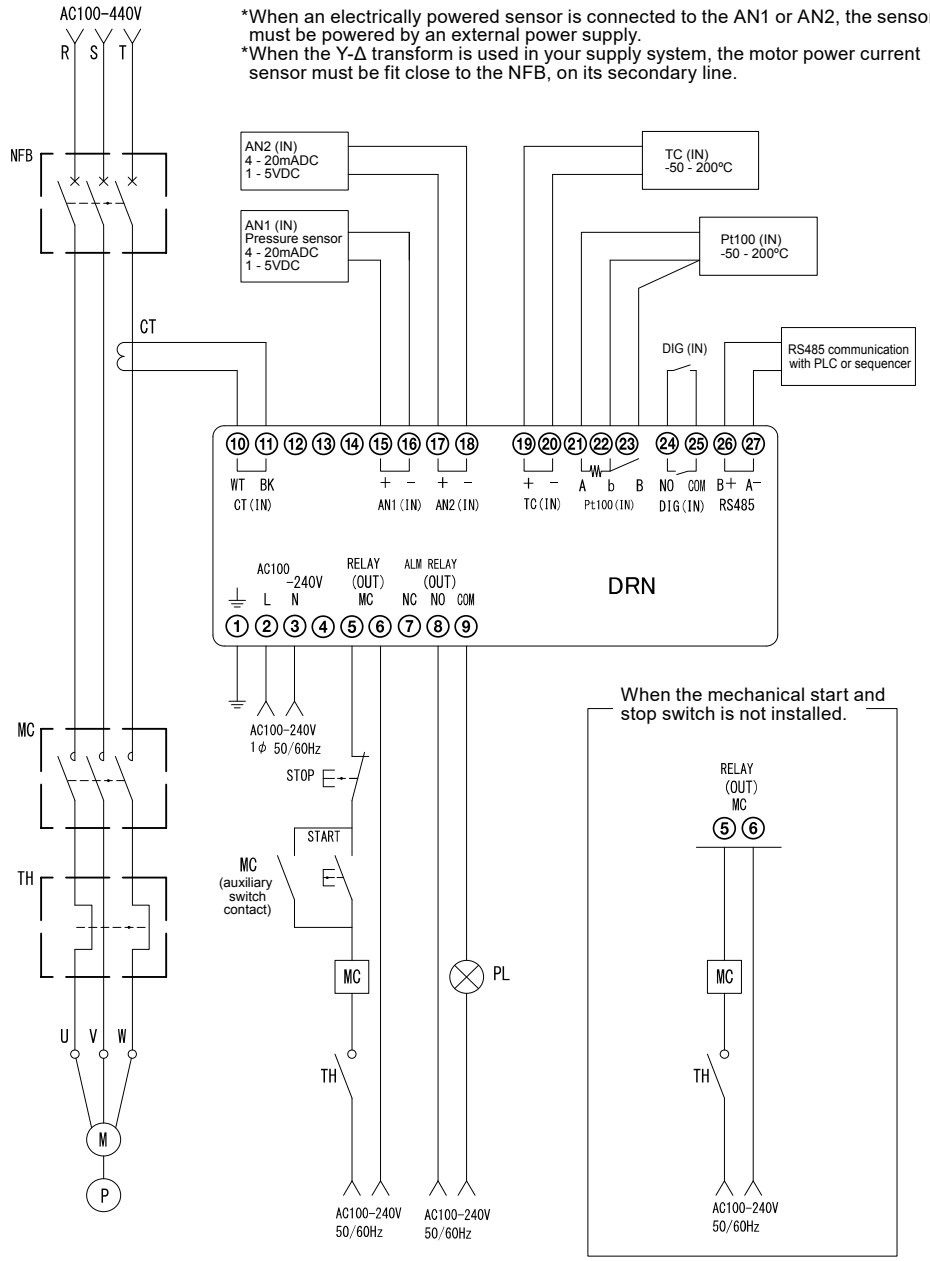


- Install a noise cut transformer via power cable.

Noise cut transformer



Wiring diagram



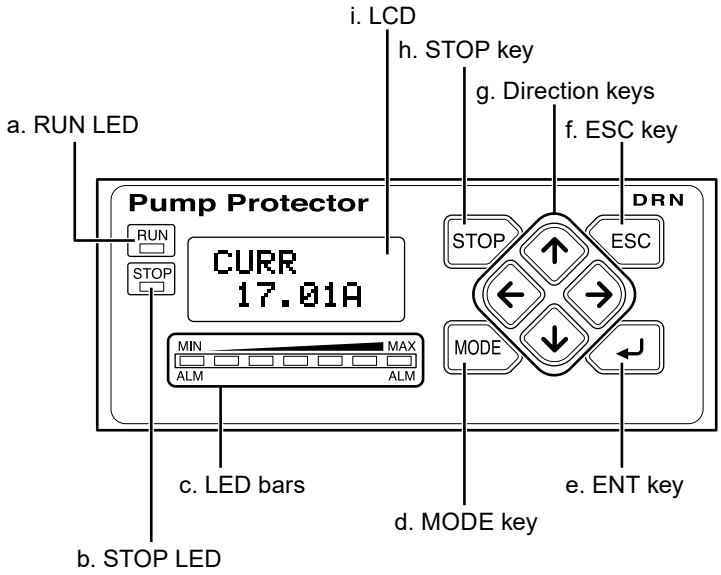
CT : Motor power current sensor
MC : Magnetic contact
Start : Mechanical start swtich
STOP : Stop
PL : Pilot lamp
NFB : Non-fuse breaker
TH : Thermal relay
M : Motor
P : Pump

Operation

This section describes protector control and programming.

Before operation

Front panel



a. RUN LED

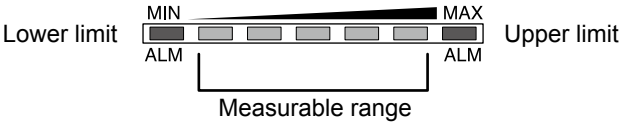
Turns to green while the pump is running.

b. STOP LED

Turns to red while the pump stops.

c. LED bar

Indicates the input signal level in between the preset upper and lower limits.



d. MODE key

Used for entering the setting mode or the configuration mode. Push of the MODE key once in the measurement mode will call up the setting mode. Press and hold of the MODE key for three seconds will call up the configuration mode.

e. ENT key

Used for entering the log view mode.

f. ESC key

Used for return to the previous setting or releasing the alarm condition.

g. Direction keys

Used for cycling through the options and increasing/decreasing numeric values.

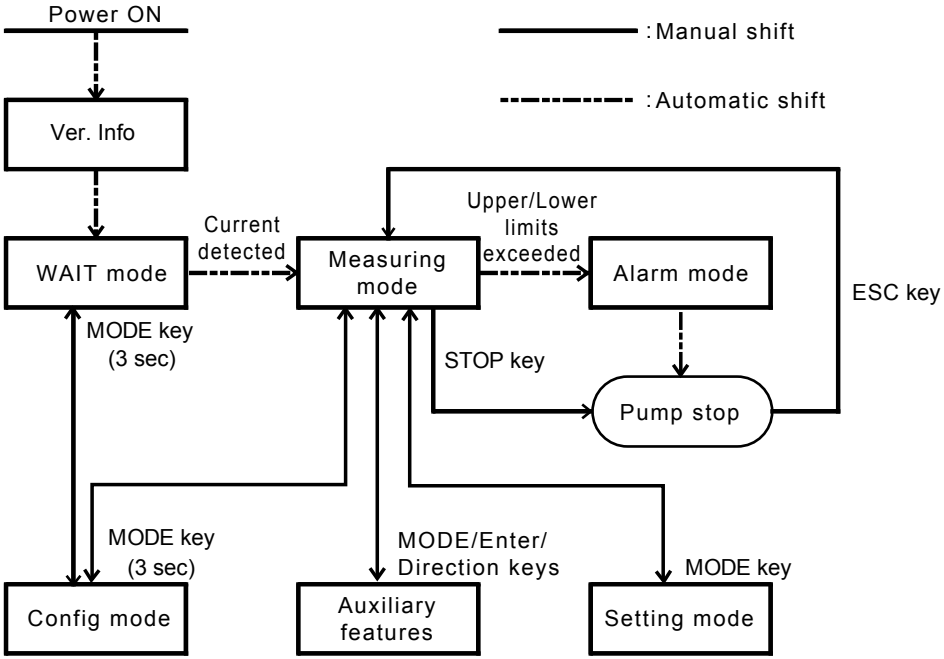
h. STOP key

Used for stopping the pump operation.

i. LCD

Shows the operating conditions of the pump, the measured and setting values.

Programming flow



*See the attached mode transition diagram as well.
*See the "DRN parameters" section on page 95 well.
*An alarm output will not be made at any mode other than the alarm mode.

Points to be checked

Before operation, check if:

- Electrical wiring (power line, input/output signal lines and RS485 communication line) is properly made. See page 32 for the DRN pin assignment.
- Each terminal connection is secured with no risk of short circuit and electrical leakage.
- The rated power voltage is observed.
- The piping is properly arranged.
- The pump is primed with liquid and ready to run.

Initial diagnostic test

After the wiring between the motor, inputs/outputs and the DRN is finished, run the pump to see if the motor rotates in the correct direction (see the motor fan cover). The rotation check procedure is divided into two depending on if your power supply system has a start switch or not. See the wiring diagram on page 34 as well.

■ Testing with a start switch on your power supply system

1 **Use the start switch on your power supply system to run the motor for a second**

See the instruction manual of the pump as well.

2 **Check for the rotational direction of the motor fan while it is rotating**

■ Testing with no switch on your power supply system

1 **Turn ON the DRN power while the STOP key is pressed**

The "PRESS MODE" indication will show up. The MC relay will turn ON to run the motor while the MODE key is pressed.

2 **Push the MODE key for a moment (no longer than one second)**

Check if the rotational direction of the motor fan is correct. If it is not correct, reconsider the motor wiring.

3 **Turn off the DRN power**

Or push the ENT or ESC key to return to the WAIT/Measuring mode.

Turning on the DRN

Do not send input signal from the sensors/inputs to the DRN before it is powered ON. This could damage the DRN.

1 **Turn ON the DRN power**

When power is applied to the DRN, the version information of the product will show up on its screen for a few seconds.

When the motor power current exceeds 0.5A (DRN-01) or 5.0A (DRN-02), the Measuring mode will show up after the start-delay time.

```
DRN-0∗
VER ∗.∗∗
```

The ">>>" indication will show up on the screen while the motor power current exceeds 0.5A (DRN-01) or 5.0A (DRN-02).

```
CURR >>>
   15.00A
```

The ">>>" indication will go off and the "CURR WAITING" shows up on the screen when the motor power current has fallen below that value.

*If the temperature is an enabled input option, the DRN shows a temperature reading at any time when the pump is powered or not.

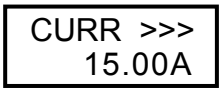
*Any alarm output is deactivated when the pump is powered off.

">>>" goes off

```
CURR
  WAITING
```

Main menu

The main menu consists of the six menu items as shown below. Use the up and down keys to scroll through each menu item.



Motor power current
The measured motor power current by the current sensor is shown on the display.

Discharge pressure
The measured discharge pressure by the pressure sensor is shown on the display if enabled via initial setup.

Analog current/voltage
The measured value such as the flow rate by the 4-20mA or 1-5V analog sensor is shown on the display if either sensor is enabled via initial setup.

Temperature (including motor, liquid or so)
The measured temperature of the motor or other objects by the type K thermocouple or Pt100 RTD is shown on the display if either is enabled via initial setup.

Digital input
The dry contact digital input allows for the external alarm reset, 2-ways setting shift, and liquid level monitoring if any one of them is enabled via initial setup.

Date & Time
The date and time is shown on the display according to initial setup.

*The measured information other than the motor power current is set disabled with the factory default setting. They can be enabled through the initial setup. See page 44 or later pages.

Alarm states

When the measured motor power current (CURR), discharge pressure (PRSS), 4-20mA/1-5VDC analog signal (ANA) or temperature (TEMP) has exceeded the upper limit or fallen below the lower limit, the max or min alarm LED bar will light. If this warning state continues over the sensing delay time of each monitoring parameter, the DRN with the STOP LED stops the pump motor and falls into the alarm state. Note, in the DIGI (LV_SNSR) alarm state, the max/min alarm LED bar will not light while the STOP LED turns ON.
Also, the DRN comes into the alarm state of "OVER CURRENT" where the motor power current has exceeded the value of the "Rated I" (max allowable current) or "OVER PRESS" where the discharge pressure has exceeded the value of "Rated P" (max allowable pressure).

Alarm types & Relay/LEDs

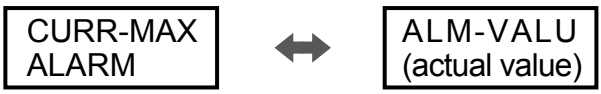
Alarm types	Delay time	MC relay	ALM relay	RUN LED	STOP LED	ALM LED
CURR-MAX/-MIN	User settable	Turned OFF	Turned ON	Turned OFF	Turned ON	Turned ON
PRSS-MAX/-MIN						
ANA-MAX/-MIN						
TEMP-MAX/-MIN						
DIGI (LV_SNSR)						
OVER CURRENT	No delay time					
OVER PRESS						

Alarm displays

"CURR-MAX ALARM", "PRSS-MAX ALARM", "ANA-MAX ALARM", or "TEMP-MAX ALARM"	Appears when the measured value has exceeded the upper limit.
"CURR-MIN ALARM", "PRSS-MIN ALARM", "ANA-MIN ALARM", or "TEMP-MIN ALARM"	Appears when the measured value has fallen below the lower limit
"DIGI (LV_SNSR) ALARM"	Appears when the "LVSNSR" option is selected in the CONFIG MODE (DIGITAL) and the DRN receives the level sensor signal.
"OVER CURRENT"	Appears when the motor power current has exceeded the "Rated I" value.
"OVER PRESSURE"	Appears when the discharge pressure has exceeded the "Rated P" value.

When the measured motor power current (CURR) has exceeded the upper limit, for example, the following displays appear in turn.

*In the alarm state of the "DIGI (LV_SNSR), the ALM-VALU display does not show up.



Alarm state cancellation

If one of any monitoring parameters has exceeded its upper or lower alarm, investigate the root cause of the abnormal condition. Then take the steps below to cancel the alarm state.

1 **In the main menu, use the up and down keys to select the "CURR", "PRSS", "ANA", "TEMP", or "DIGI" monitoring display which is highlighted with the alarm indication and push the ESC key once.**

The alarm state is cancelled and the pump can be started.

*In the alarm state of the "OVER CURRENT" where the motor power current has exceeded the value of "Rated I" (max allowable current) or the "OVER PRESS" where the discharge pressure has exceeded the value of "Rated P" (max allowable pressure), reduce the measured value at or below that preset value and then push the ESC key to release that state. Any other key operation is disabled.

*In the alarm state of the "CURR-MAX/-MIN ALARM", "PRSS-MAX/-MIN ALARM", "ANA-MAX/-MIN ALARM", "TEMP-MAX/-MIN ALARM", or "DIGI ALARM (LV_SNSR)", push the ESC key to release that state or the ENT key to shift to the event log view mode.

Emergency stop

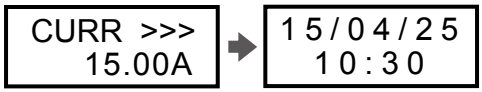
In case of emergency, push the STOP key on the DRN front panel. The pump stops running.

*Push the ESC key to cancel the emergency stop. Any key operation other than the ESC key is disabled.

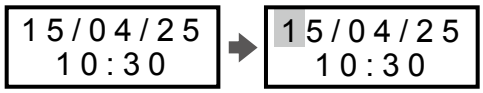
Date & Time setting

Set the current year, month, day, hour (military time) and minute to the protector. You will need to readjust the system clock every time the DRN is returned to factory default settings or when the system clock battery is dead.

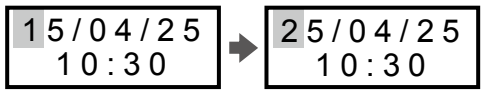
1 **In the main menu item, push the up and down keys to select the date and time setting**



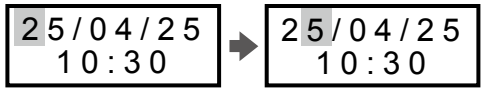
2 **Push the mode key once**



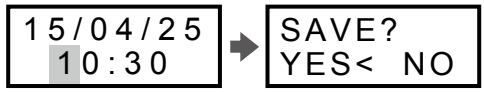
3 **Use the up and down keys to change the highlighted value**



4 **Use the right and left keys to move the cursor between the digits**

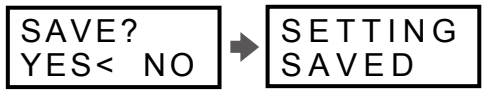


5 **Push the enter key once**



6 **Select "YES"**

The screen will return to the date and time setting menu



Initial setup

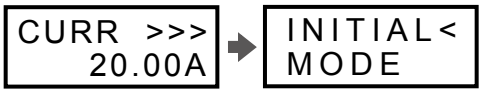
Enter the rated current/pressure of the pump, the sensor types, and other basic information to the DRN.

■ Motor power current input

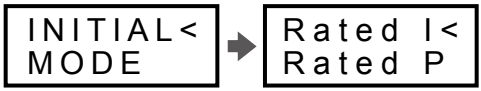
1 **Press and hold the "MODE" key for three seconds in any of the main menu items**

The configuration menu will show up.

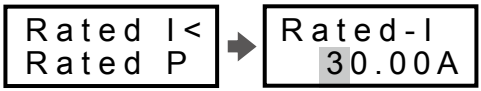
*In the configuration mode, any alarm output is disabled.



2 **Use the up and down keys to select the "INITIAL" option and push the enter key**



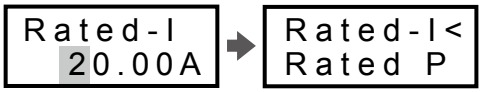
3 **Use the up and down keys to select the "Rated I" option and push the enter key**



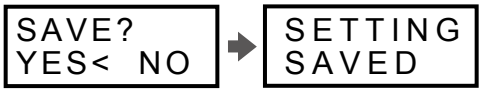
4 **Use the direction keys to enter the rated power current of the motor**

See the nameplate of the motor for its rated current. If the DRN reading has exceeded this value, the protector immediately stops the pump with the "OVER CURRENT" alarm on the screen.

*If this alarm condition occurs in the measuring mode, reduce the actual power current to or below the rated value and then push the ESC key to cancel.



5 **Push the "ESC" key twice and save the setting**

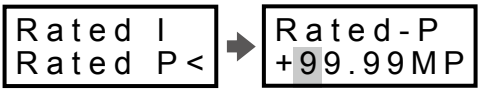


■ **Discharge pressure input**

1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

2 **Use the up and down keys to select the "INITIAL" option and push the enter key**

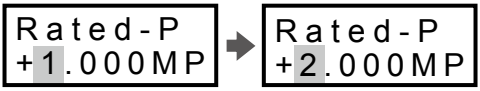
3 **Use the up and down keys to select the "Rated P" option and push the enter key**



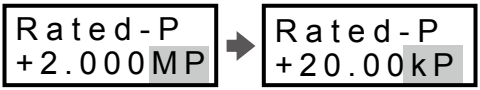
4 **Use the direction keys to move the cursor and enter the maximum allowable discharge pressure of the pump**

See the instruction manual of pump to be used for its own maximum allowable discharge pressure that differs with pump models.

*The discharge pressure can have only one decimal point in it.
*The "+" symbol can be changed with the up or down keys with the cursor on it.



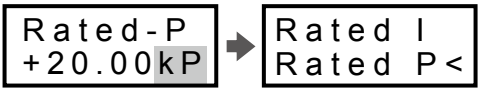
5 **Use the direction keys to move the cursor and select a pressure unit from the "Pa", "kP" and "MP" options**



6 **Push the enter key**

If the DRN reading has exceeded the entered value, the protector immediately stops the pump with the "OVER PRESSURE" alarm on the screen.

*If this alarm condition occurs in the measuring mode, reduce the actual discharge pressure to or below the max value and then push the ESC key to cancel.



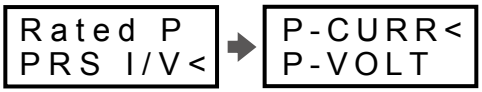
7 **Push the "ESC" key twice and save the setting**

■ **4-20mA/1-5VDC pressure input**

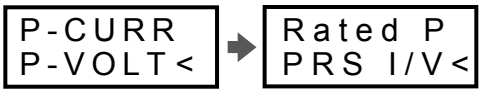
1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

2 **Use the up and down keys to select the "INITIAL" option and push the enter key**

3 **Use the up and down keys to select the "PRS I/V" option and push the enter key**



4 **When using the 4-20mA pressure sensor, select the "P-CURR" option, when using the 1-5VDC pressure sensor, select the "P-VOLT" option and push the enter key**



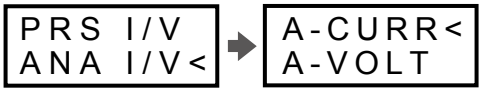
5 **Push the "ESC" key twice and save the setting**

■ **4-20mA/1-5VDC analog input**

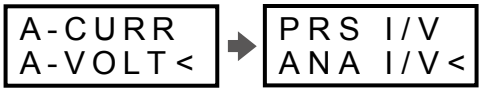
1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

2 **Use the up and down keys to select the "INITIAL" option and push the enter key**

3 **Use the up and down keys to select the "ANA I/V" option and push the enter key**



4 **When using the 4-20mA analog sensor, select the "A-CURR" option, when using the 1-5VDC analog sensor, select the "A-VOLT" option and push the enter key**



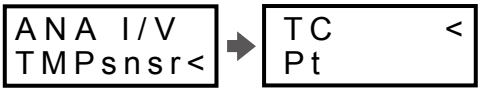
5 **Push the "ESC" key twice and save the setting**

■ **Temperature input**

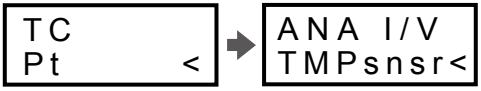
1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

2 **Use the up and down keys to select the "INITIAL" option and push the enter key**

3 **Use the up and down keys to select the "TMPsnsr" option and push the enter key**



4 **When using the type K thermocouple, select the "TC" option, when using the Pt100RTD, select the "Pt" option and push the enter key**



5 **Push the "ESC" key twice and save the setting**

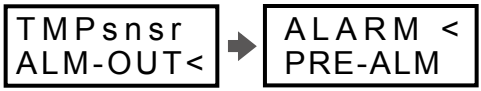
■ **Alarm/Pre-Alarm**

See page 74 for more info about the Pre-Alarm feature.

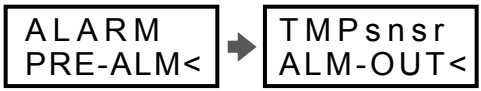
1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

2 **Use the up and down keys to select the "INITIAL" option and push the enter key**

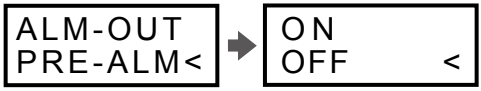
3 **Use the up and down keys to select the "ALM-OUT" option and push the enter key**



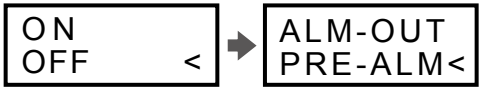
4 **When using the alarm output, select the "ALARM" option and push the enter key. When using the pre-alarm output, select the "PRE-ALM" option and push the enter key**



5 **If the pre-alarm output is selected at the step 4, push the down key to select the "PRE-ALM" option below the "ALM-OUT" and push the enter key**



6 **Select the "ON" option and push the enter key**



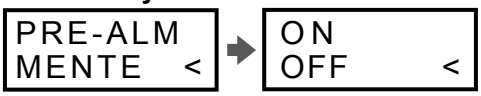
7 **Push the "ESC" key twice and save the setting**

■ **Maintenance reminder**

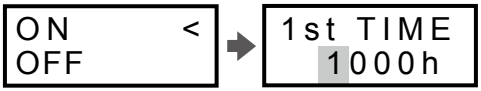
1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

2 **Use the up and down keys to select the "INITIAL" option and push the enter key**

3 **Use the up and down keys to select the "MENTE" option and push the enter key**

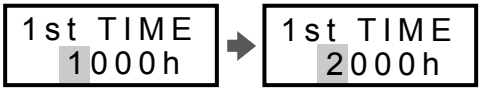


4 **Use the up and down keys to select the "ON" option and push the enter key**



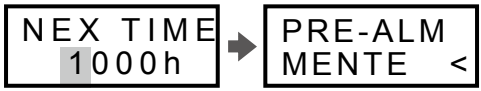
5 **Use the direction keys to enter the first reminder interval (accumulated MC relay ON time) and push the enter key**

The DRN will show a reminder on the screen if the time has passed.



6 **Enter the second or later reminder interval and push the enter key**

The DRN will show a reminder on the screen if the time has passed.



7 **Push the "ESC" key twice and save the setting**

If the reminder intervals are renewed, the accumulated MC relay ON time (pump ON time) will be cleared.

Upper/Lower limits

The upper and lower limits must be set to the monitoring parameters of the motor power current (CURR), discharge line pressure (PRSS), analog current/ voltage signal (ANA) and motor/liquid temperature (TEMP).

Preliminary setting

A control mode ("CONFIG"→"MODE"), the start delay time ("CONFIG"→"S-DELAY"), the alarm logic ("CONFIG"→"ALM-LGC"), the enabling/disabling of inputs (Main menu→"Measure") and the analog signal-pressure scaling must be set properly before the upper and lower limits are entered to the DRN.

■ Control modes

The DRN has the manual, easy and auto control modes. Select the optimal control mode for your operating environment.

MANUAL:

Choose the MANUAL control mode when the optimal upper/lower limits of monitoring parameters are predetermined in advance. The upper and lower limits are to be manually entered to the DRN.

EASY:

Choose the EASY control mode when the optimal upper/lower limits of monitoring parameters are not determined, but then the possible flow range of the pump only is known and a discharge valve is provided on the system for the adjustment of a pump output in that range. The DRN automatically takes in the upper and lower limits while the pump is running at the both ends.

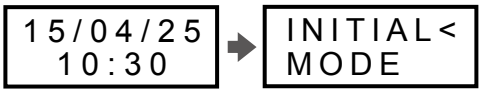
AUTO:

Choose the AUTO control mode when the optimal upper/lower limits of monitoring parameters are not determined, and a discharge valve is not provided for the adjustment of the pump output either. The DRN automatically calculates and takes in the upper and lower limits while the pump is running at a duty point.

*Only simplified setting can be made via the EASY and the AUTO control modes. You can move to the MANUAL mode for the full setting options without loosing the EASY/ AUTO settings. Note additional MANUAL settings will be lost when the control mode is returned from the MANUAL to the EASY/AUTO.

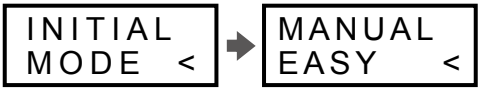
1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

The configuration menu will show up.



2 **Use the up and down keys to select the "MODE" option and push the enter key**

3 **Use the up and down keys to select the "MANUAL", "EASY", or "AUTO" option and push the enter key**



4 **Push the "ESC" key once and save the setting**

■ Start-delay time

The start-delay time is set to 5 seconds with the factory default setting. It must be adjusted to cover the actual start up time for the pump to reach its duty point (5 to 20 seconds in general).

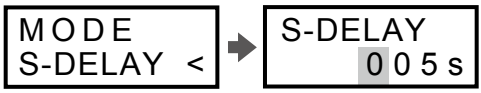
NOTE

- The DRN does not send out any alarm signals during the start-delay time.
- If the start-delay time is set too long, it may disturb detecting abnormality.

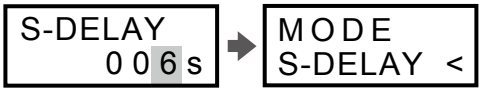
1 **Press and hold the "MODE" key for 3 seconds in any of the main menu options**

The configuration menu will show up.

2 **Use the up and down keys to select the "S-DELAY" option and push the enter key**



3 **Enter the time the pump requires for start up and push the enter key**



4 **Push the "ESC" key once and save the setting**

■ **Alarm logic**

The DRN has the "OR", "AND", and "TrblFnd" alarm logics. Select an optimal logic in your operating conditions.

OR:

The DRN sends an alarm if any one of the monitoring parameters of "CURR", "PRSS", "ANA", "TEMP", and "DIGI" has exceeded the upper or lower limit.

AND:

The DRN sends an alarm if the monitoring parameters of "CURR", "PRSS", and "ANA" have exceeded the upper or lower limit at the same time or if either "TEMP" or "DIGI" alone has exceeded either limit.

TrblFnd:

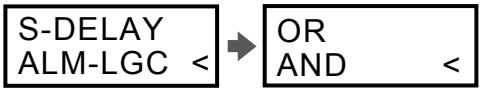
The DRN sends an alarm if any one of the operating parameters of "CURR", "PRSS", "ANA", "TEMP", and "DIGI" has exceeded the upper or lower limit. In this logic, the DRN also indicates the possible cause based on the Pressure - Motor current diagnosis (page 88) if either "CURR" or "PRSS" alone has exceeded either limit.

*When the "TrblFnd" is used, a 0-20mA/0-5VDC analog pressure sensor must be electrically connected to the AN1 (IN) input (15th and 16th terminals) in advance.

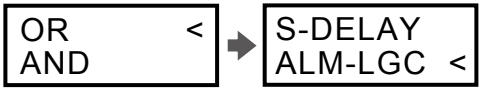
1 **Press and hold the "MODE" key for three seconds in any of the main menu options**

The configuration menu will show up.

2 **Use the up and down keys to select the "ALM-LGC" option and push the enter key**



3 **Use the up and down keys to select the "OR", "AND", or "TrblFnd" option and push the enter key**



4 **Push the "ESC" key once and save the setting**

Enabling/Disabling inputs

Enable or disable the inputs of the motor power current (CURR), discharge pressure (PRSS), analog current/voltage (ANA), motor/liquid temperature (TEMP), and the dry contact digital input (DIGI) as needed in your operating environment.

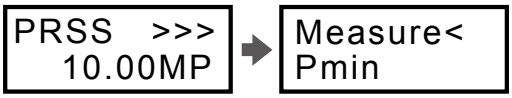
*With the factory default setting, any other inputs other than the motor power current (CURR) are set disabled. The motor power current is a key parameter and can not be set disabled.

■ MANUAL control mode

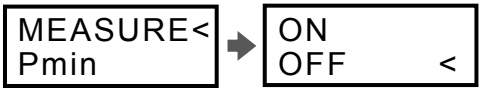
When the "MANUAL" control mode has been selected via the configuration mode, the input options to be enabled must be set individually.

1 **In the main menu, use the up and down keys to choose an input option to be enabled and push the MODE key once**

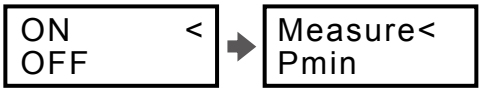
For example, the "PRESS" input option is chosen here.



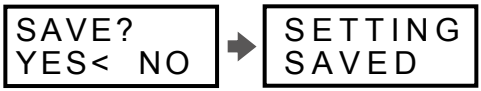
2 **Push the enter key**



3 **Select the "ON" option and push the enter key**



4 **Push the "ESC" key once and save the setting**



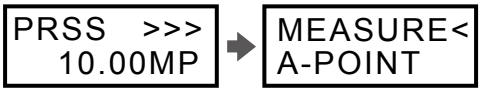
■ EASY control mode

When the "EASY" control mode has been selected via the configuration mode, the input options of the discharge pressure (PRSS) and the analog current/ voltage (ANA) can be enabled/disabled. The temperature input option (TEMP) and the dry contact digital input (DIGI) are to be set on or off manually. See the above for the steps in the MANUAL control mode.

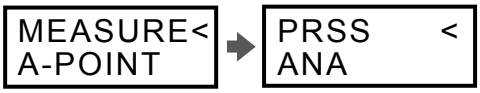
*The motor power current (CURR) option is always set enabled.

1 **In the main menu, use the up and down keys to choose any of the "CURR", "PRSS" and "ANA" input option and push the MODE key once**

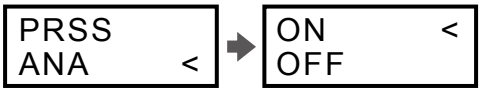
For example, the "PRESS" input option is chosen here.



2 **Push the enter key**

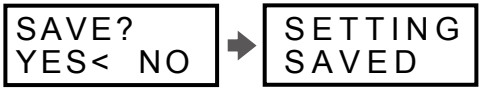


3 **Select the "PASS" or "ANA" option and push the enter key**



4 **Select the "ON" or "OFF" option and push the enter key**

5 **Push the "ESC" key twice and save the setting**



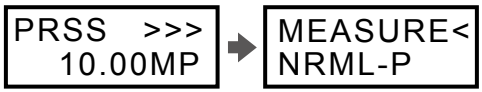
■ AUTO control mode

When the "AUTO" control mode has been selected via the configuration mode, the input options of the discharge pressure (PRSS) and the analog current/ voltage (ANA) can be enabled/disabled. The temperature input option (TEMP) and the dry contact digital input (DIGI) are to be set on or off manually. See page 55 for the steps in the MANUAL control mode.

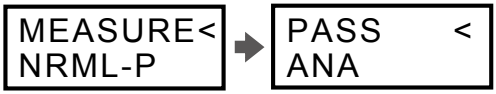
*The motor power current (CURR) option is always set enabled.

1 **In the main menu, use the up and down keys to choose any of the "CURR", "PRSS", and "ANA" input option and push the MODE key once**

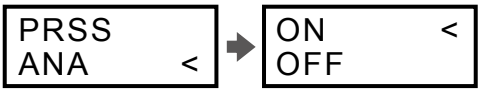
For example, the "PRESS" input option is chosen here.



2 **Push the enter key**

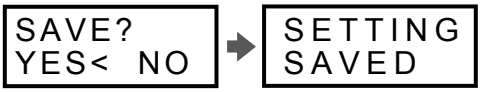


3 **Select the "PASS" or "ANA" option and push the enter key**



4 **Select the "ON" or "OFF" option and push the enter key**

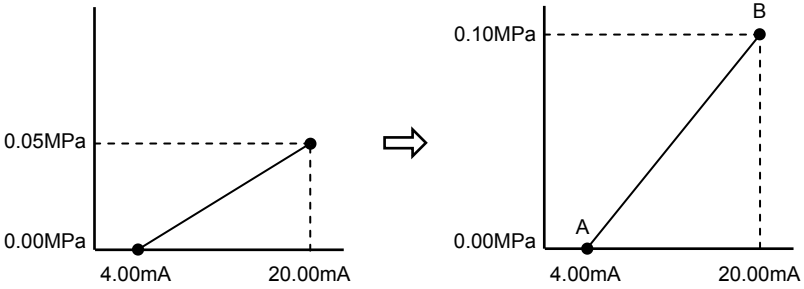
5 **Push the "ESC" key twice and save the setting**



Scaling

This function can be set in any of the manual, easy and auto control modes. The mA or VDC reading of a pressure or an analog sensor can be converted into Pa, kP or MPa, and the range of those units are adjustable.

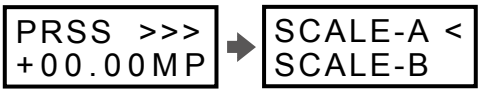
If the MPa range to 4-20mA is changed from 0.00-0.05MPa to 0.00-0.10MPa, for example, it becomes in the image:



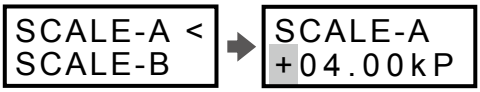
■ Pressure sensor

In the steps below, the current/voltage reading is to be adjusted to the pressure range of 0.00kPa to +10.00kPa when 4-20mA/1-5VDC analog pressure sensor is used with the DRN.

1 **In the main menu, choose the "PRSS" input option and press and hold the enter key for 3 seconds**

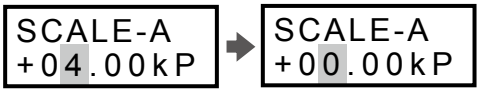


2 **Select the "SCALE-A" option and push the enter key**

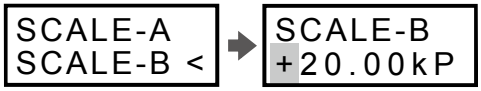


3 **Use the direction key to enter the pressure value which corresponds to 4mA or 1VDC and push the enter key**

The pressure unit of "Pa", "kP", or "MPa" shown on the DRN must be chosen in advance. See page 45, the discharge pressure input section, step 5, in the ***"Initial setup"*** field for detail.

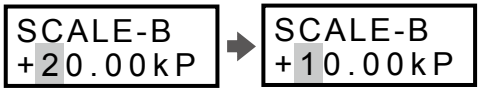


4 **Select the "SCALE-B" option and push the enter key**



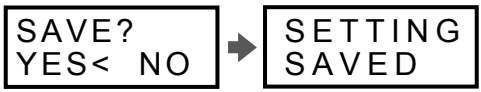
5 **Use the direction key to enter the pressure value which corresponds to 20mA or 5VDC and push the enter key**

The pressure unit of "Pa", "kP", or "MPa" shown on the DRN must be chosen in advance. See page 45, the discharge pressure input section, step 5, in the ***"Initial setup"*** field for detail.



6 **Push the "ESC" key once and save the setting**

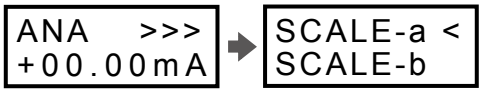
The DRN shows the adjusted pressure reading on its screen.



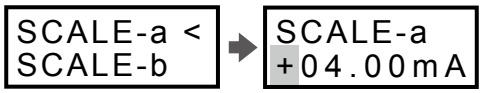
■ **Analog sensor**

In the step below, the current/voltage reading is to be adjusted to the flow range of 0.0L to 100.0L when 4-20mA/1-5VDC analog sensor is used with the DRN. Any one of "mA", "A", "mV", "V", "Pa", "kP", "MPa", "°C", "l", "pH", "br", "Ps", "°F", and "%" units is available.

1 **In the main menu, choose the "ANA" input option and press and hold the enter key for 3 seconds.**

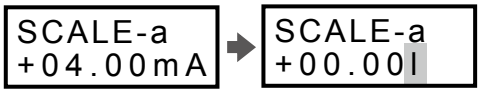


2 **Select the "SCALE-A" option and push the enter key**

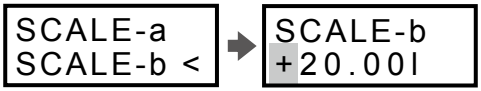


3 **Use the direction key to enter a value and unit which corresponds to 4mA or 1VDC and push the enter key**

*If two or more decimal points are entered, the setting will be cancelled.

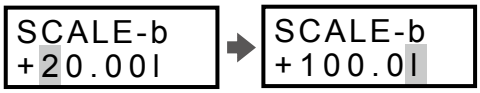


4 **Select the "SCALE-B" option and push the enter key**



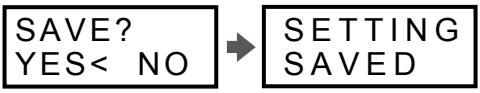
5 **Use the direction key to enter a value and unit which corresponds to 20mA or 5VDC and push the enter key**

*If two or more decimal points are entered, the setting will be cancelled.



6 **Push the "ESC" key once and save the setting**

The DRN shows the adjusted reading and unit on its screen.



Dry contact digital input

The DRN can also control the pump operation in accordance with ON and OFF of the external dry contact digital signal to the DRN. The control functions include the external alarm reset, the 2-way setting shift and the level sensor monitoring. These three functions can not be used at the same time. Choose one of them which is most needed for your system as well as the optimal type of contact (normally-open or normally-closed) through the configuration mode.

External alarm reset (EXT_RST)

As well as the direct keypad operation of the DRN, a remote input of the DIG (IN) signal (24th and 25th terminals) can restart the pump suspended in the alarm state. To enable this function, the "EXT_RST" option must be selected via the configuration mode in advance.

2-way setting shift (EVENT)

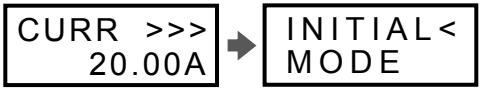
A remote input of the DIG (IN) signal (24th and 25th terminals) can shift the DRN between two different settings of the event 1 and 2. To enable this function, the "EVENT" option must be selected via the configuration mode in advance. The event 1 and 2 in any of the MANUAL, EASY, or AUTO control mode have their own upper and lower limits of the monitoring parameters and the start delay time. To shift between the event 1 and 2, choose the digital output logic of the "OPEN-ON" or "CLOSE-ON" via the configuration mode.

Level sensor (LV_SNSR)

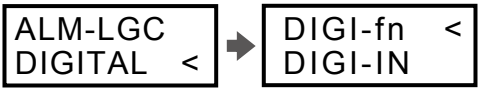
A remote input of the DIG (IN) signal (24th and 25th terminals) from the level sensor stops the pump when the liquid level in the supply tank has reached the allowable lowest level for the prevention of the friction heat damage to the pump. To enable this function, the "LV_SNSR" option must be chosen in advance.

1 **Press and hold the "MODE" key for 3 seconds in any of the main menu options**

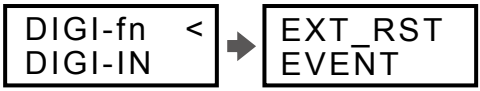
The configuration menu will show up.



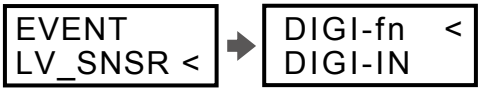
2 **Use the up and down keys to select the "DIGITAL" option and push the enter key**



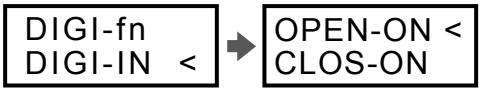
3 **Select the "DIGI-fn" option and push the enter key**



4 **Select the "EXT_RST", "EVENT", or "LV_SNSR" option and push the enter key**

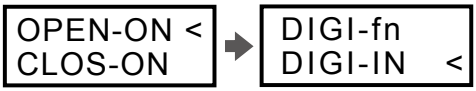


5 **Select the "DIGI-IN" option and push the enter key**

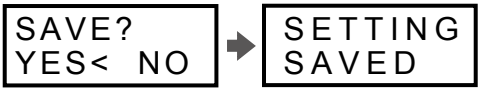


6 **Select the contact type**

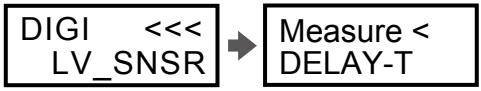
Choose the "OPEN-ON" option when the contact type is normally-closed. Choose the "CLOS-ON" option when it is normally-open type.



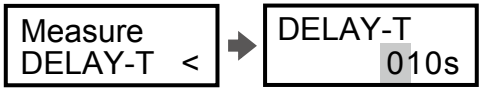
7 **Push the "ESC" key twice and save the setting**



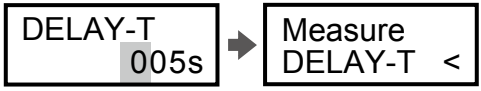
8 **If the "LV_SNSR" option is selected at the step 4, select the "DIGI" main menu option and push the MODE key once**



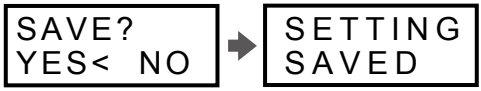
9 **Select the "DELAY-T" option and push the enter key**



10 **Set the sensing delay time of the level sensor and push the enter key**



11 **Push the "ESC" key once and save the setting**

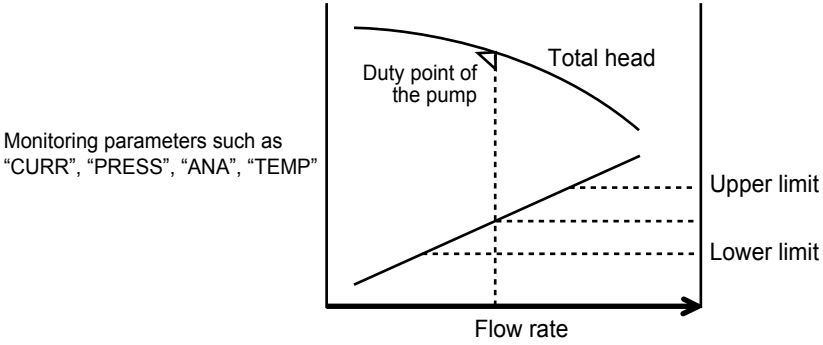


Upper/Lower limit and Sensing delay time

Take the steps below to set the upper and lower limits of the measured motor power current, discharge pressure, 4-20mA/1-5VDC analog signal and temperature as well as their sensing delay time for stable pump control. The DRN stops the pump when a valid setting of the limits has been exceeded by a measured value. A short delay time could often disturb the pump operation while a long delay time could leave the pump and system in unfavourable condition for a long time. The optimal delay time could change depending on operating conditions. In general, it would be 5 to 10 seconds, and the DRN default setting is 5 seconds.

■ MANUAL control mode

Choose the MANUAL control mode when the optimal upper/lower limits of measured parameters of the "CURR", "PRESS", "ANA", or "TEMP" are predetermined in advance. The upper and lower limits are to be manually entered to the DRN. The DRN reading could often exceed the upper/lower limits and disturb the pump operation when they are set too close to the duty point of the pump. They must set away from the normal level with an appropriate distance.

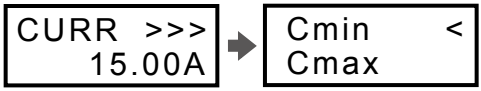


Upper/Lower limit setting to the "CURR" (/"PRESS"/"ANA"/"TEMP")

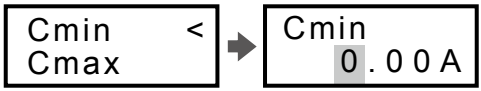
The manual control mode must be set via the configuration mode in advance.

See page 51 for setting steps.

1 **In the main menu, choose the "CURR" input option and press the mode key once**

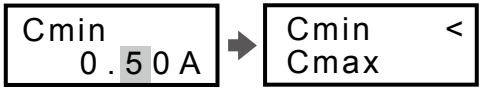


2 **Select the "Cmin" and push the enter key**

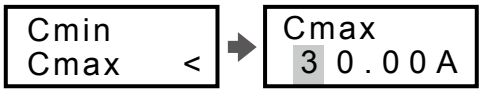


3 **Set the lower limit current and push the enter key**

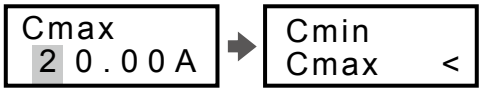
*Do not set the lower limit below the possible minimum motor power current that represents the minimum flow rate, or abnormal conditions such as dry running will not be detected.



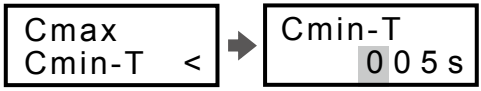
4 **Select the "Cmax" and push the enter key**



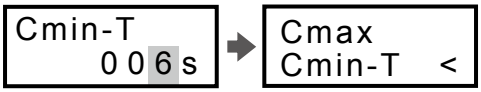
5 **Set the upper limit current and push the enter key**



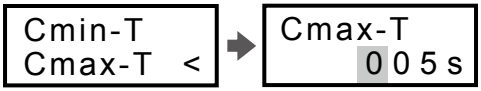
6 **Select the "Cmin-T" and push the enter key**



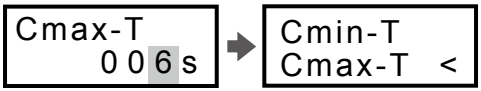
7 **Set the sensing delay time for the lower limit and push the enter key**



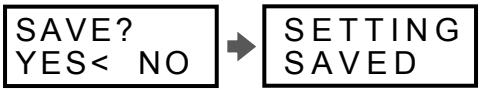
8 **Select the "Cmax-T" and push the enter key**



9 **Set the sensing delay time for the upper limit and push the enter key**



10 **Push the "ESC" key once and save the setting**



NOTE

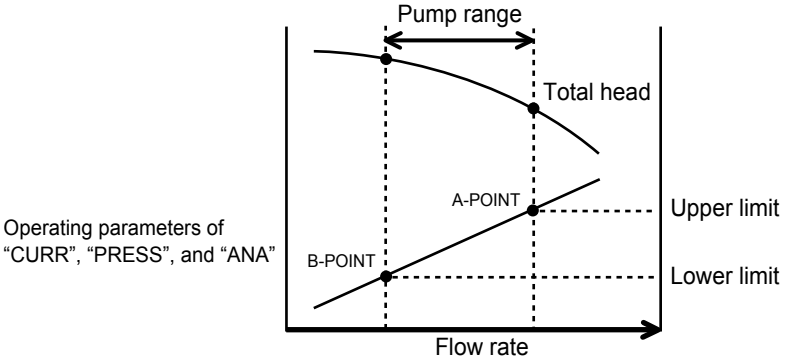
- Choose the "PRESS", "ANA", and "TEMP" input options in the main menu and set the upper/lower limits and the sensing delay times as well.
- The upper/lower limits and the sensing delay times of the "TEMP" input option established here are the common settings between the MANUAL, EASY and AUTO control modes.

■ **EASY control mode**

Choose the EASY control mode when the optimal upper/lower limits of monitoring parameters of "CURR", "PRESS", and "ANA" are not determined, but then the possible flow range of the pump only is known and a discharge valve is provided on the system for the adjustment of a pump output in that range. The DRN automatically takes in the upper and lower limits while the pump is running at the both ends.

*A discharge valve is always required for the setting with the EASY control mode for the adjustment of the flow rate. Do not use a suction valve for the adjustment. Occurrence of cavitation will damage the pump with friction heat.

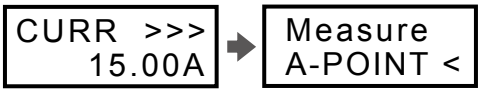
*The upper and lower limits of the "PRESS" and "ANA" modes are established if each mode is enabled.



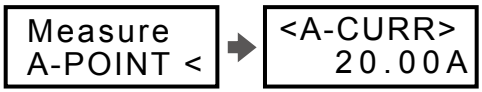
Upper/Lower limit setting to the "CURR", "PRESS", and "ANA"

The easy control mode must be set via the configuration mode in advance.
See page 51 for setting steps.

1 **In any of the "CURR", "PRSS", and "ANA" main menu options, press the mode key once**



2 **Choose the "A-POINT" option and press the enter key once**

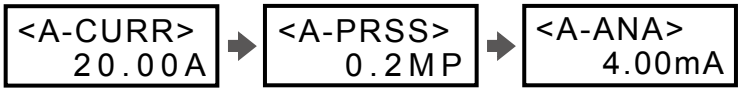


3 **Run the pump at the lowest operating point (lowest flow rate)**

4 **Use the right and left keys to cycle through/check the current, pressure, and analog input readings**

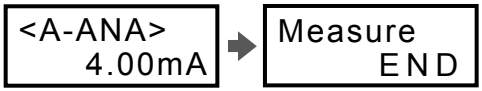
Check the readings are all acceptable values as lower limits.

*The upper and lower limits of the "PRESS" and "ANA" modes are established if each mode is enabled.

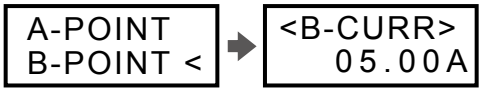


5 **Push the enter key**

*The DRN checks if readings stay constant by the "SAFEwide" value and rejects entry with the "ERROR1" message if a reading is out of range. The best "SAFEwide" range changes with operating/installation conditions. The range can be adjusted via the "Other" option of the "Config" mode.



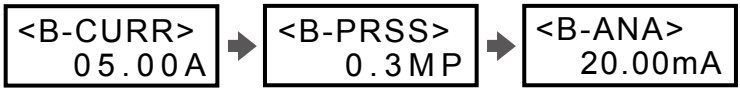
6 **Choose the "B-POINT" option and press the enter key once**



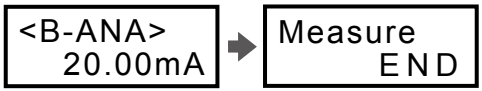
7 **Run the pump at the highest operating point (highest flow rate)**

8 **Use the right and left keys to cycle through/check the current, pressure, and analog input readings**

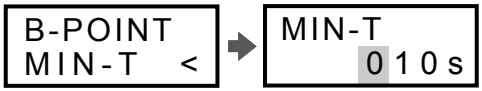
Check the readings are all acceptable values as upper limits.



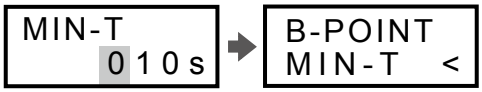
9 **Push the enter key**



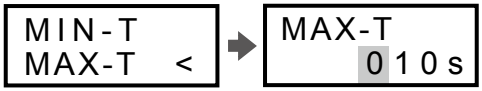
10 **Select the "MIN-T" and push the enter key**



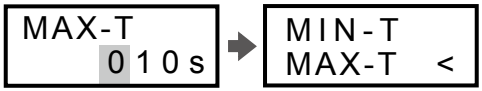
11 **Set the sensing delay time for the lower limit and push the enter key**



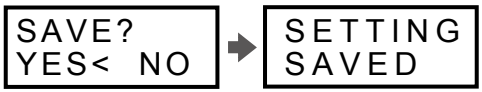
12 **Select the "MAX-T" and push the enter key**



13 **Set the sensing delay time for the upper limit and push the enter key**



14 **Push the "ESC" key once and save the setting**



NOTE

The "MIN-T" and "MAX-T" are the common settings between the "CURR", "PRSS", and "ANA" measurement. The "CURR" option is always set to ON but the others are selective. If both "PRSS" and "ANA" options, or either of them, is turned ON in the setting mode, the "MIN-T" and "MAX-T" settings take part in the control of the "PRSS" and/or "ANA" measurement. If both, or either of them, is turned OFF in the setting mode, the "MIN-T" and "MAX-T" settings are viewed in the LOG MODE ("SETTING" option → "DELAY-T" option) but then have no hand in the control of the "PRSS" and/or "ANA" measurement.

■ **AUTO control mode**

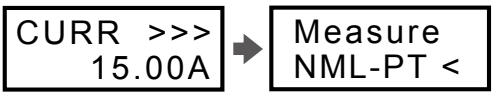
Choose the AUTO control mode when the optimal upper/lower limits of monitoring parameters of "CURR", "PRESS", and "ANA" are not determined, and a discharge valve is not provided for the adjustment of the pump output either. The DRN automatically calculates and takes in the upper and lower limits while the pump is running at a duty point.

*The upper and lower limits of the "PRESS" and "ANA" modes are established if each mode is enabled.

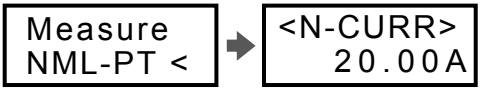
Upper/Lower limit setting to the "CURR", "PRESS", and "ANA"

The auto control mode must be set via the configuration mode in advance. See page 51 for setting steps.

1 **In any of the "CURR", "PRSS", and "ANA" main menu options, press the mode key once**



2 **Choose the "NML-PT" option and press the enter key once**

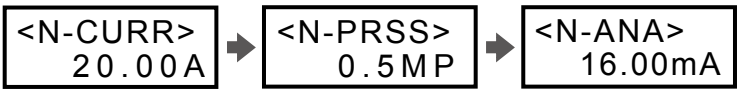


3 **Run the pump at the rated operating point (rated flow rate)**

4 **Use the right and left keys to cycle through/check the current, pressure, and analog input readings**

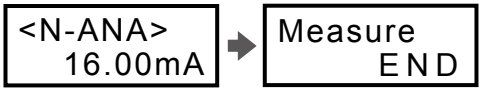
Check the readings are all acceptable values as duty point parameters.

*The upper and lower limits of the "PRESS" and "ANA" modes are established if each mode is enabled.

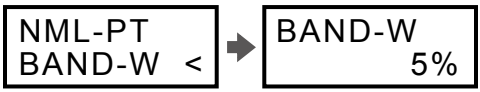


5 **Push the enter key**

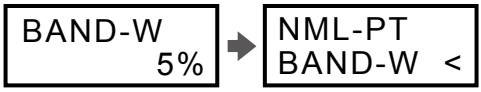
*The DRN checks if readings stay constant by the "SAFEwide" value and rejects entry with the "ERROR1" message if a reading is out of range. The best "SAFEwide" range changes with operating/installation conditions. The range can be adjusted via the "Other" option of the "Config" mode.



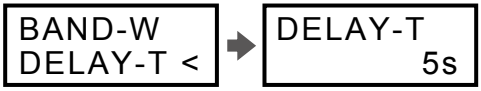
6 **Select the "BAND-W" and push the enter key**



7 **Set the bandwidth (%) which is provided on and beneath the duty point parameters at step 4**

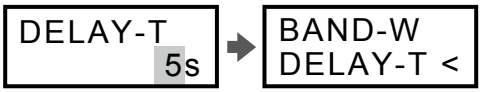


8 **Select the "DELAY-T" and push the enter key**

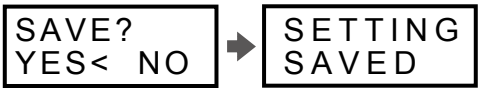


9 **Set the sensing delay time and push the enter key**

The same delay time is set to both the upper and lower limits.



10 **Push the "ESC" key once and save the setting**

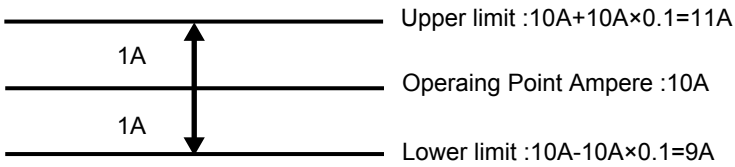


NOTE

- In the AUTO control mode, the upper and lower limits are determined based on the following calculation.

  Upper limit = OPA (Operating Point Ampere) + OPA × Operating bandwidth (%)
  Lower limit = OPA - OPA × Operating bandwidth (%)

  With the setting of the 10A OPA and 10% bandwidth, the limits is:



- In the AUTO control mode, the upper and lower limit settings depends on the "BAND-W" % value and therefore the minimum resolution is 1%. If you need the finer adjustment to the upper and lower limits, go to the MANUAL control mode. See page 65 as well.

- Use of a 0.75kW or smaller motor could fall below the lowest allowable limit of 0.50A (JS10FL current sensor range: 0.50-30.00A).

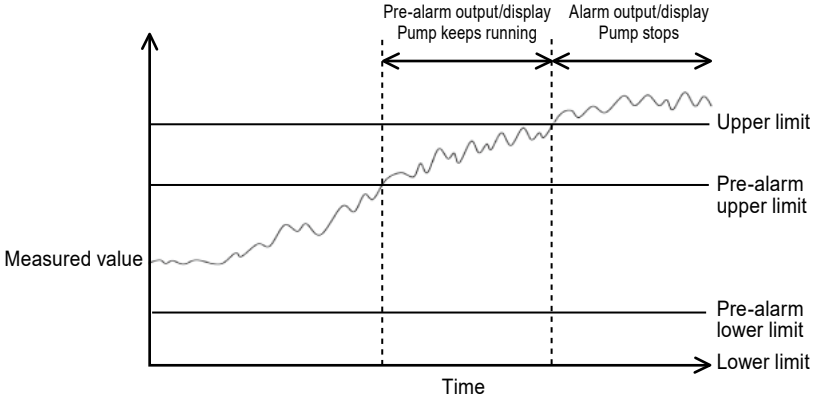
- The "DELAY-T" is the common setting between the "CURR", "PRSS", and "ANA" measurement. The "CURR" mode is always set to ON but the others are selective. If both "PRSS" and "ANA" options, or either of them, is turned ON in the setting mode, the "DELAY-T" setting takes part in the control of the "PRSS" and/or "ANA" measurement. If both, or either of them, is turned OFF in the setting mode, the "DELAY-T" setting is viewed in the LOG MODE ("SETTING" option → "DELAY-T" option) but then has no hand in the control of the "PRSS" and/or "ANA" measurement.

Auxiliary features

The DRN has some auxiliary features as shown below.

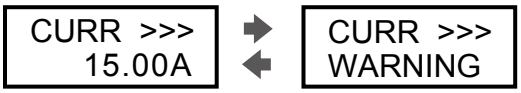
Pre-Alarm

The appropriate use of the pre-alarm upper/lower limits will detect increment or decrement of the DRN reading before it has exceeded the alarm upper/lower limits and the MC relay deactivates to stop the motor.



When the Pre-Alarm is output/displayed:

The DRN shows the measured value and the "WARNING" indication in turn.

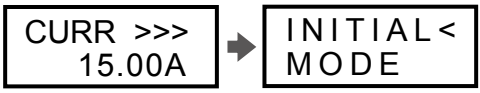


DRN setting for enabling the pre-alarm limits is:

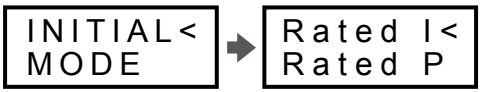
Mode	Setting options	Selection	Conditions
"INITIAL" Config mode (Mode key 3 sec)	ALM-OUT	PRE-ALM (Default: ALARM)	Both the Alarm and Pre-Alarm limits are used to the alarm relay.
	PRE-ALM	ON (Default: OFF)	The Pre-Alarm limit setter appears in the setting mode.
Setting mode (Mode key pushed once)	<In MAN mode> Cmin-P, Cmax-P	Numeric value entry by user	Setting of the pre-alarm upper/ lower limits manually to the DRN
	<In EASY/AUTO> MIN-P, MAX-P		

■ **Enabling the Pre-Alarm**

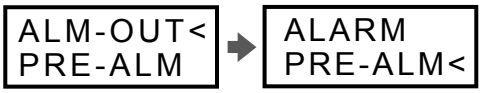
1 **Press and hold the "MODE" key for 3 seconds in any of the main menu options**



2 **Select the "INITIAL" option and push the enter key**



3 **Use the up and down keys to select the "ALM-OUT" option and push the enter key**



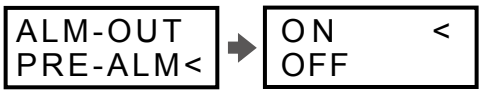
4 **Select the "PRE-ALM" option and push the enter key**

The DRN returns to the previous menu layer.

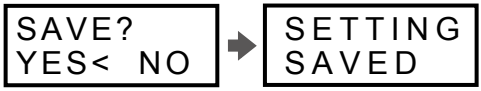
5 **Select the "PRE-ALM" option below the "ALM-OUT" and push the enter key**

6 **Select the "ON" option and push the enter key,**

Or the Pre-Alarm limit setter does not appear in the setting mode.



7 **Push the "ESC" key twice and save the setting**



■ **Manual control mode (Pre-Alarm)**

Upper/Lower limit setting to the "CURR", "PRESS", "ANA" or "TEMP":

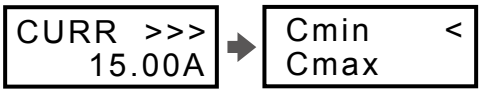
The manual control mode must be set via the configuration mode in advance.

See page 51 for setting steps.

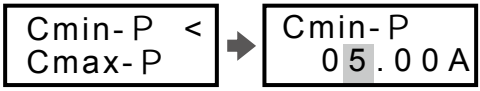
*The DRN reading could often exceed the Pre-Alarm upper and lower limits and disturb the pump operation if they are set close to duty point parameters of the pump.

*The steps below must be taken at each enabled parameters of "CURR", "PRESS" and "TEMP" as well.

1 **In the main menu, choose the "CURR" input option and press the enter key once**

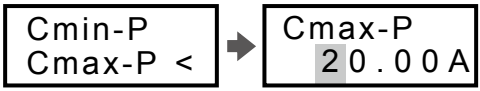


2 **Select the "Cmin-P" and push the enter key**



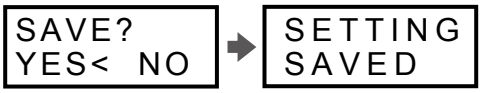
3 **Set the lower limit current and push the enter key**

4 **Select the "Cmax-P" and push the enter key**



5 **Set the upper limit current and push the enter key**

6 **Push the "ESC" key once and save the setting**



■ **EASY/AUTO control mode (Pre-Alarm)**

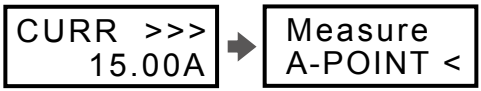
Upper/Lower limit setting to the "CURR", "PRESS" and "ANA":

The easy or auto control mode must be set via the configuration mode in advance. See page 51 for setting steps.

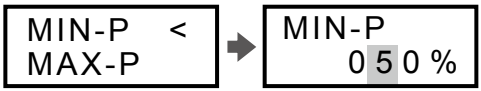
*The limit setting to the "TEMP" is made in the same way as the steps in the manual control mode.

*The % setting to the "MIN-P" and "MAX-P" values are valid to both the "CURR", "PRESS", and "ANA" limit settings.

1 **In any of the "CURR", "PRSS", and "ANA" main menu options, press the mode key once**

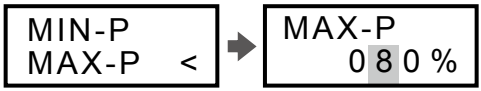


2 **Select the "MIN-P" and push the enter key**



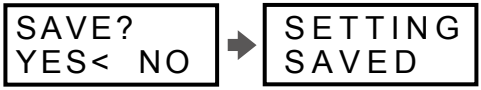
3 **Set the lower limit current and push the enter key**

4 **Select the "MAX-P" and push the enter key**



5 **Set the upper limit current and push the enter key**

6 **Push the "ESC" key once and save the setting**



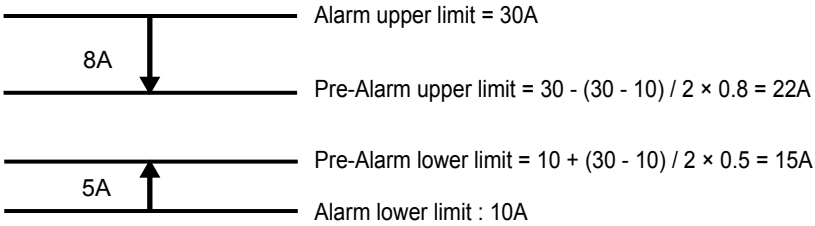
NOTE

The Pre-Alarm upper/lower limits are determined by the following formula. The larger percentage set to the "MAX-P" or "MIN-P" setting option is, the increased pre-alarm sensitivity the DRN will have.

Pre-Alarm upper limit
= Alarm upper limit - (Alarm upper limit - Alarm lower limit) /2 × "MAX-P"

Pre-Alarm lower limit
= Alarm lower limit + (Alarm upper limit - Alarm lower limit) /2 × "MIN-P"

If the "MAX-P" value is set to 80% and the "MIN-P" value is set to 50%:



Reading adjustment

The motor power current reading or the temperature reading of the DRN can be adjusted to the reading of a reference ammeter or thermometer.

■ Motor power current reading

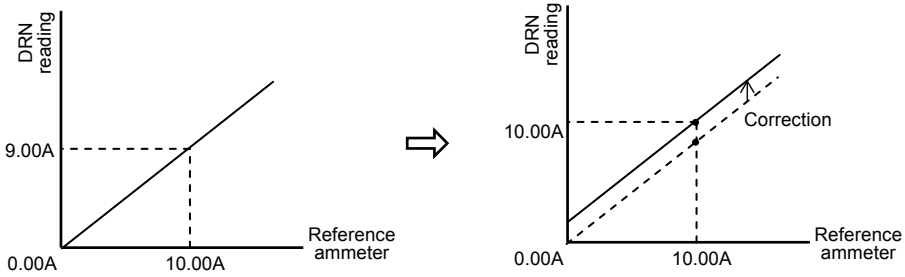
When the DRN current reading is 9.00A and the reference ammeter reading is 10.00A, for example, just change the DRN reading to the ammeter value.

Note only the currently measured DRN reading can be adjusted.

*The DRN returns to the wait mode if the reading has fallen below the minimum detection level (0.50A with the JS10FL current sensor or 5.0A with the JS24FL).

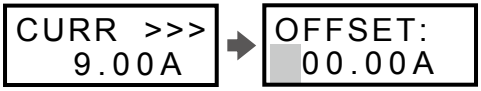
*The return level of 0.50A or 5.0A is shifted upwards wit this adjustment.

*The return level of 0.50A or 5.0A is not be shifted downwards with this adjustment.

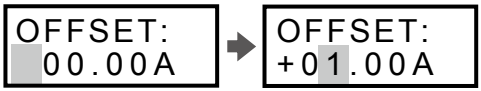


1 **In the main menu, choose the "CURR" input option and press and hold the enter key for 3 seconds**

Offset range: ±2.00A (DRN-01), ±20.0A (DRN-02)

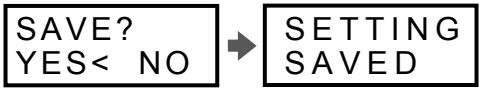


2 **Use the direction keys to enter the reference ammeter current**



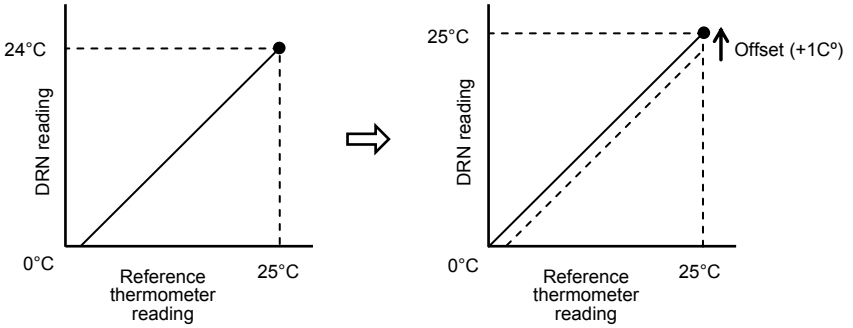
3 **Push the enter key once and save the setting**

The DRN shows the adjusted current reading on its screen.

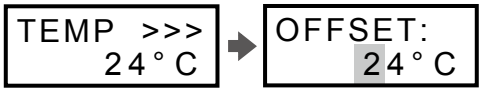


■ Temperature reading

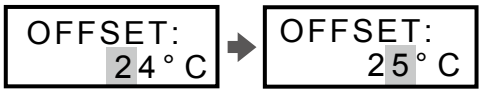
When the DRN temperature reading is 24°C and the reference thermometer reading is 25°C, for example, just change the DRN reading to 24°C.
Note this temperature adjustment is possible up to plus or minus 5°C range. Any adjustment over that range will be rejected.



1 **In the main menu, choose the "TEMP" input option and press and hold the enter key for 3 seconds**

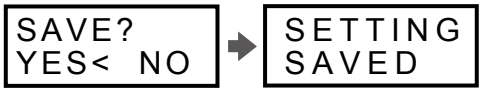


2 **Use the direction keys to enter the reference thermometer temperature**



3 **Push the enter key once and save the setting**

The DRN shows the adjusted temperature reading on its screen.



Event log view mode

The DRN logs the monitoring parameters shown below.

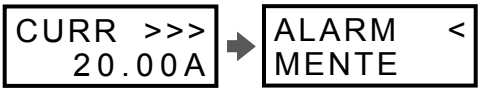
■ Alarm (ALARM)

The past 20 alarm events and times can be viewed back.

*If the 20 year-life internal battery went dead, the internal clock will be disabled. In this case the clock-based event logs such as the alarm log, maintenance time log, and accumulated operation times log will be no longer available.

*Any alarm will not be turned on in this view mode.

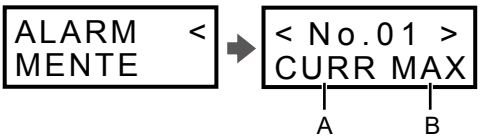
1 **In any of the main menu options, push the enter key once**



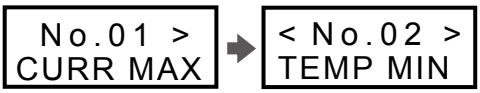
2 **Choose the "ALARM" option and push the enter key once**

The "CURR", "PRSS", "ANA", "TEMP", or "DIGI" in the "A" field shows an input that detected the too-low or too-high value. The "MAX" or "MIN" in the "B" field shows whether the measured value has exceeded the upper limit or fallen below the lower limit.

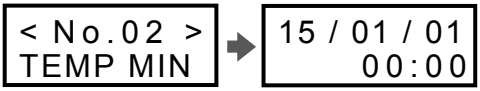
*The "DIGI DEG", "OVERCURR", and "OVERPRESS" messages also show up.



You can cycle through/check the max 20 logs with the right and left keys.



If the enter key pushed once more, the alarm day and time will be shown.

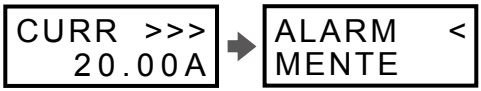


3 **Push the "ESC" key twice to move back to the main menu.**

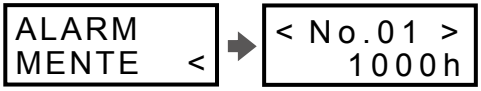
■ Maintenance time (MENTE)

The past 10 maintenance reminder intervals and the reminder confirmation days & times can be viewed back.

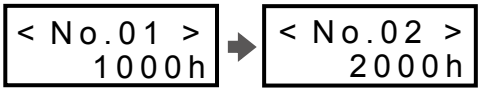
1 **In any of the main menu options, push the enter key once**



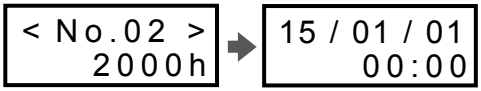
2 **Choose the "MENTE" option and push the enter key once**



You can cycle through/check the max 10 logs with the right and left keys. Each log shows the maintenance reminder interval (accumulated amount of pump operating time) to the next pump inspection/maintenance.



If the enter key is pushed once more, the day & time when the past maintenance reminder was confirmed will be shown.

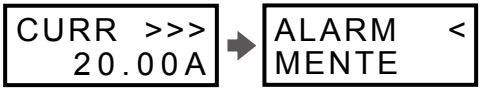


3 **Push the "ESC" key twice to move back to the main menu**

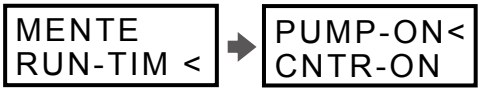
■ Accumulated operation times (RUN-TIM)

The accumulated amount of operation time of the pump and the DRN can be viewed.

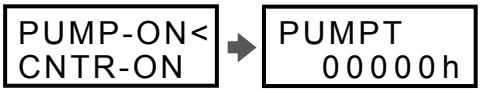
1 **In any of the main menu options, push the enter key once**



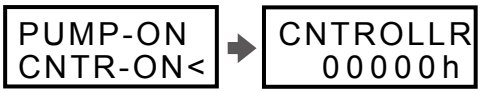
2 **Choose the "RUN-TIM" option and push the enter key once**



When you want to check the accumulated operation time of the pump, choose the "PUMP-ON" option and push the enter key once. Push the enter key once more to escape.



When you want to check the accumulated operation time of the DRN, choose the "CNTR-ON" option and push the enter key once. Push the enter key once more to escape.

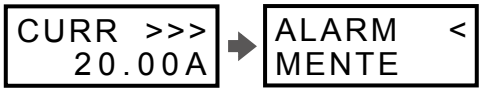


3 **Push the "ESC" key twice to move back to the main menu**

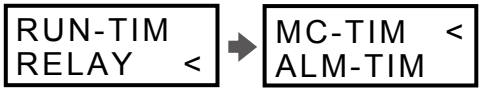
■ Total number of relay ON times (RELAY)

The accumulated operation time of the MC relay and alarm relay can be viewed.

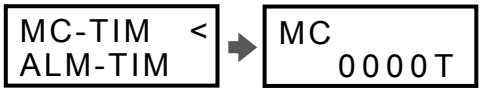
1 **In any of the main menu options, push the enter key once**



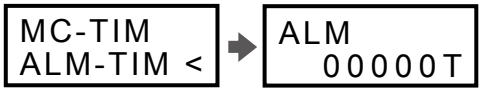
2 **Choose the "RELAY" option and push the enter key once**



When you want to check the total number of MC relay ON times, choose the "MC-TIM" option and push the enter key once.
Push the enter key once more to escape.



When you want to check the total number of ALM-TIM relay ON times, choose the "ALM-TIM" option and push the enter key once.
Push the enter key once more to escape

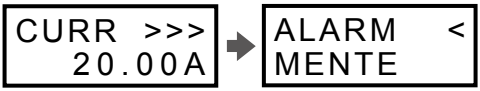


3 **Push the "ESC" key twice to move back to the main menu**

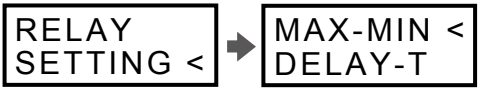
■ Valid settings (SETTING)

The upper and lower limits and sensing delay times set to the motor power current, discharge pressure, the 0-20mA/0-5VDC analog signal and a temperature can be viewed.

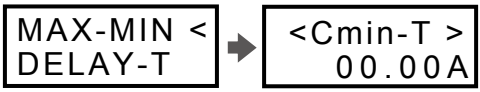
1 **In any of the main menu options, push the enter key once**



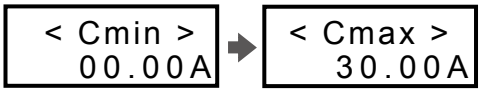
2 **Choose the "SETTING" option and push the enter key once**



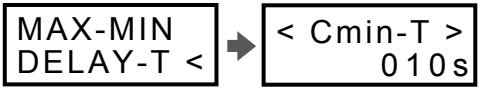
When you want to check the upper and lower limits at each monitoring parameter, choose the "MAX-MIN" option and push the enter key once.



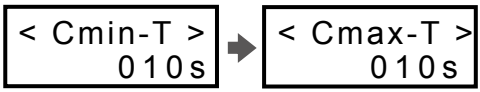
You can cycle through/check the upper/lower limits of parameters with the right and left keys. Push the enter key once to escape.



When you want to check the sensing delay times at each monitoring parameter, choose the "DELAY-T" option and push the enter key once.



You can cycle through/check the sensing delay times of parameters. Push the enter key once to escape.

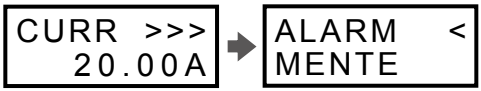


3 **Push the "ESC" key twice to move back to the main menu**

■ Model identification (MODEL)

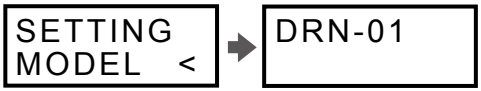
The model identification of your DRN can be viewed.

1 **In any of the main menu options, push the enter key once**



2 **Choose the "MODEL" option and push the enter key once**

The model identification of the DRN will be shown.



3 **Push the "ESC" key twice to move back to the main menu**

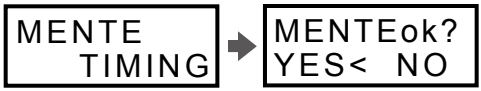
Maintenance reminder

The maintenance reminder of the DRN reminds you of the need for inspection and maintenance every time the maintenance interval has passed. See page 82 as well. Note that the best maintenance interval changes with operating conditions such as the pump type, piping system and liquid properties.

■ Reminder confirmation

Once the maintenance reminder shows up, it will stay on the screen until it is confirmed by user.

1 **Push the ESC key when the reminder is shown on the screen**



2 **Choose the "YES" option and push the enter key once**

The maintenance reminder will have been confirmed. This confirmation time is logged to the DRN and can be viewed through the event log view mode.

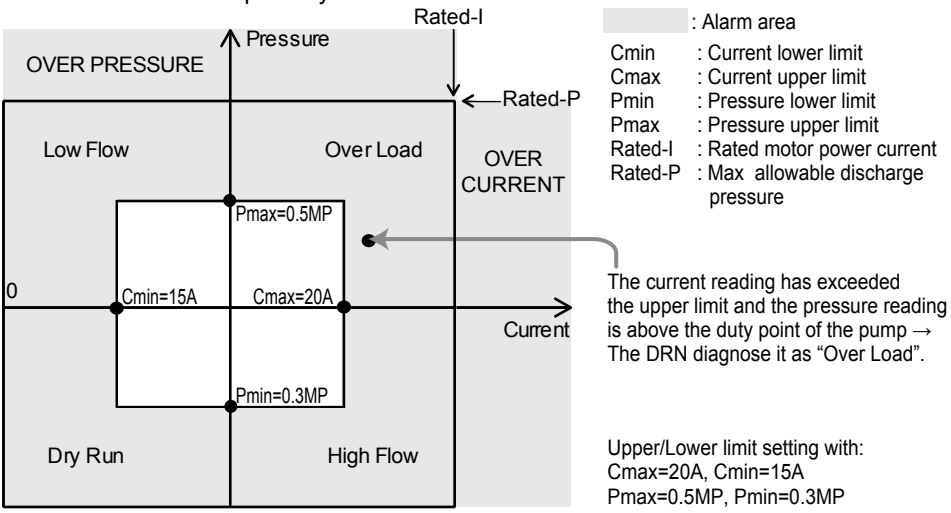
Pressure - Motor current diagnosis

When the DRN observes at least the monitoring parameters of the motor power current and the discharge pressure, and either or both of them have exceeded their upper limit or fallen below lower limit, the DRN determines the most possible cause from the diagnosis diagram below and shows the following alarm messages.

*The diagnosis starts 3 sec after the start delay time period.

*The diagnosis may not work correctly if the duty point of the pump has been changed after the upper and lower limits are set to the DRN.

*A pressure sensor needs to be installed to the discharge line of the pump to utilize this function. Purchase separately.



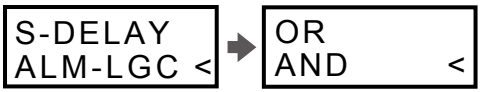
Alarm messages	Possible causes
Low Flow	A closed discharge line
	A clogged filter in the discharge line
Dry Run	Dry running, Cavitation, Operation with entrained air or a clogged filter in the suction line
Over Load	Increment of liquid specific gravity, or Faulty/damaged motor
High Flow	Shifted duty point of the pump (e.g. an operated discharge valve)
Over Current	The higher motor power current than the rated level
High Pressure	System pressure is too high.

*Remove the possible causes before restarting the pump. These causes mainly have roots in the pump operation. See the instruction manual of the pump to be used.

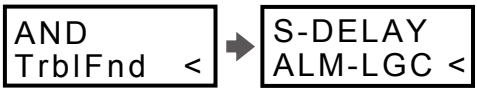
*The "Low Flow", "Dry Run", "Overload", and "High Flow" messages are not registered in the alarm log.

1 **Press and hold the "MODE" key for 3 seconds in any of the main menu options (in the measuring mode)**

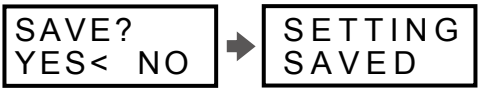
2 **Select the "ALM-LGC" option and push the enter key**



3 **Select the "TrblFnd" option and push the enter key**



4 **Push the "ESC" key once and save the setting**



Cavitation detection

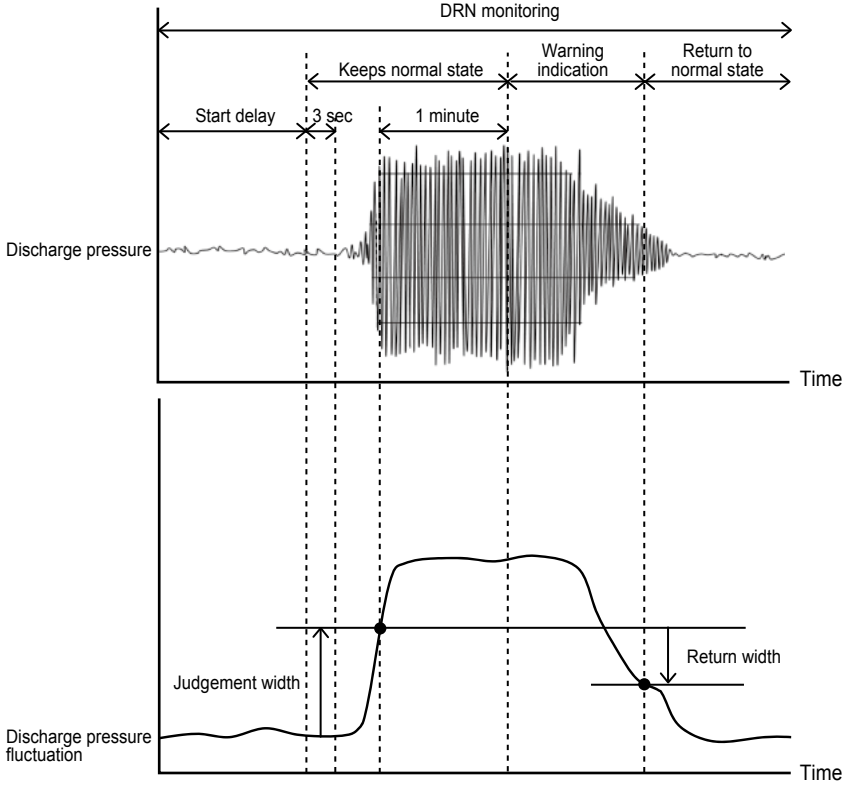
If an analog pressure sensor is used with the DRN to monitor the discharge line pressure, an appropriate judgement width can help the DRN to detect a sharp and a short frequency pressure fluctuation which often accompanies cavitation. The DRN will show an warning indication on its screen if a measured fluctuation width has exceeded the judgement width (user settable) that is made based on the starting fluctuation width (a 3-second period fluctuation range right after the end of the start delay time), and if this state continues for one minute or more. The warning indication will disappear once the pressure fluctuation width reduces and stays within the return width.

The warning indication will appear when:

Measured fluctuation width - Starting fluctuation width ≥ Judgement width

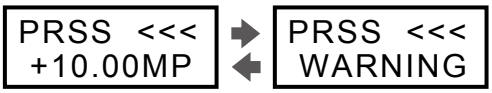
The warning indication will disappear when:

Measured fluctuation width - Starting fluctuation width ≤ Judgement width - Return width



NOTE

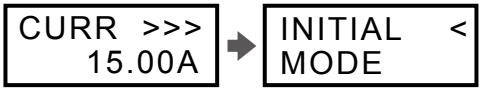
- Always set the value of judgement width bigger than the return width. Or the warning will never be cancelled.
- The cavitation detection becomes automatically enabled when the pressure sensor is attached to the DRN.
- In the warning state, the DRN will shows its reading and the warning indication in turn.



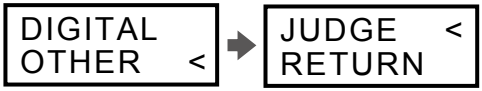
■ Judgement/Return width

Adjust the judgement and the return width to the best as necessary.

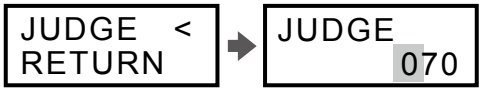
1 **In any of the main menu options, press and hold the MODE key for 3 seconds**



2 **Choose the "OTHER" option and push the enter key once**

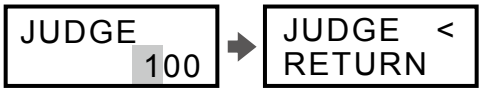


3 **Choose the "JUDGE" option and push the enter key**



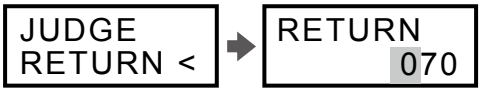
4 **Adjust the judgement width to the proper level and push the enter key**

*The warning state is called earlier if this value is set smaller.



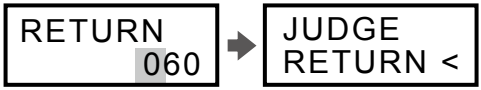
Operation

5 **Select the "RETURN" option and push the enter key**

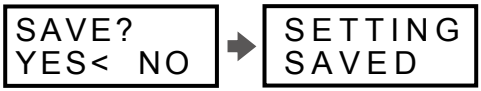


6 **Adjust the return width to the proper level and push the enter key**

*The warning state is cancelled earlier if this value is set smaller.



7 **Push the "ESC" key twice and save the setting**



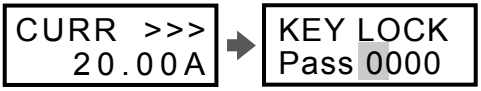
Keypad lock

DRN keypads can be locked for the prevention of erroneous key operation.

■ **Keypad lock activation**

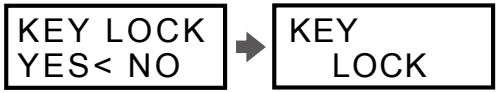
1 **In the measuring mode, press the right and left direction keys at the same time and hold them for 3 seconds**

Use the direction keys to establish your PIN code and push the enter key.



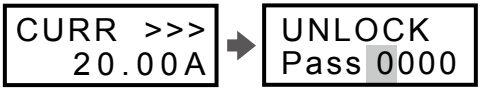
2 **Choose the "YES" option and push the enter key once**

Any keypad operation will be cancelled while keys are locked.



■ **Keypad lock deactivation**

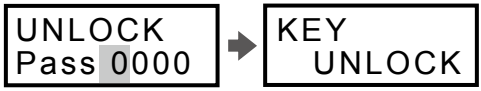
1 **In any of the main menu options, press the "ESC" key once**



2 **Use the direction keys to enter your PIN code and push the enter key.**

The "KEY UNLOCK" message appears and then it returns to the main menu.

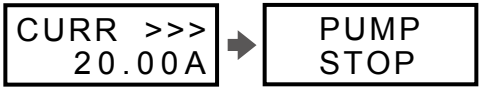
*Your PIN code is important for the keypad lock deactivation. Do not loose it. Contact us if you have lost your PIN code.



■ **Emergency stop with keypads locked**

1 **Press and hold the STOP key for 3 seconds**

The pump stops running.

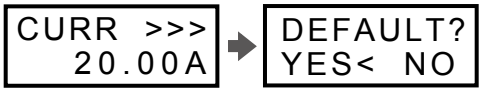


Initialization (monitoring parameters)

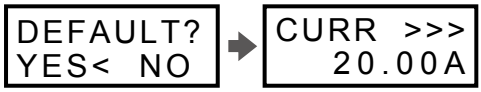
The user setting parameters in the manual, easy, and auto control modes only are to be initialized with the factory presets. The configuration parameters are not initialized and remain the same. See page 95 and later pages for the parameters to be initialized.

■ **Initialization process**

1 **In any of the main menu options, press and hold the ESC key for 3 seconds**



2 **Select the "YES" option and push the enter key**



Factory defaulting (all settings)

The DRN can return all the configuration and setting parameters to the factory presets. See page 90 as well.

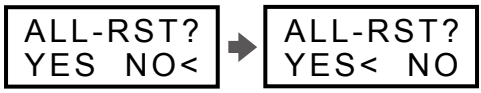
■ **Factory defaulting process**

1 **Turn on the DRN power while the ESC and the STOP key are pressed.**

Hold the both keys until the following message shows up.

2 **Select "YES" option and push the enter key**

The DRN will stand by with the all settings initialized to the factory presets.



Configuration mode

The configuration mode will be called up when the mode key is pressed for 3 seconds in any of the main menu options.

1st layer	2nd layer	3rd layer	Setting range	Default value	Initialization*	Setting*
INITIAL	Rated I	-	DRN-01 : 0.5 - 99.99A	30.00A	-	
		-	DRN-02 : 5.0 - 999.9A	200.0A	-	
	Rated P	-	0 - 9999 (with a decimal point/a unit)	99.99MP	-	
	PRS I/V	-	P-CURR/P-VOLT	P-CURR	-	
	ANA I/V	-	A-CURR/A-VOLT	A-CURR	-	
	TMPsnsr	-	TC/Pt	TC	-	
	ALM-OUT	-	ALARM/PRE-ALM	ALARM	-	
	PRE-ALM	-	ON/OFF	OFF	-	
	MENTE	-	ON/OFF	OFF	-	
		1st TIME (if enabled)	0 - 9999	1000h	-	
		NXT TIME (if enabled)	0 - 9999	500h	-	
MODE	-	-	MANUAL/EASY/AUTO	EASY	-	
S-DELAY	-	-	5 - 999s	5s	-	
ALM-LGC	-	-	OR/AND/TrblFnd	OR	-	
DIGITAL	DIGI-fn	-	EXT RST/EVENT/LV_SNSR	EXT RST	-	
	DIGI-IN	-	OPEN-ON/CLOS-ON	CLOS-ON	-	
OTHER	SAFEwid	-	1 - 999	50	-	
	JUDGE	-	0 - 999	70	-	
	RETURN	-	0 - 999	10	-	
COMMUN	RS485	-	ON/OFF	OFF	-	
	ADDRESS	-	1 - 31	1	-	
	bps	-	1200/2400/4800/9600/19200/38400	9600	-	
	CharLen	-	7bit/8bit	7bit	-	
	STOPbit	-	1bit/2bit	2bit	-	
	PARITY	-	NON/ODD/EVEN	NON	-	
	TIMEOUT	-	5sec/4sec/3sec/2sec 1sec/0sec	4sec	-	

*In the initialization field, the parameters that return to factory presets via the initialization process (page 94) are checked.

*Enter the set values to the setting field for your later reference.

Manual control mode (EVENT 1)

1st layer	2nd layer	3rd layer	Setting range	Default value	Initiali-zation*	Setting
CURR	Cmin	-	DRN-01 : 0.00 - 30.00	0.00A	✓	
		-	DRN-02 : 0.0 - 200.0	0.0A	✓	
	Cmax	-	DRN-01 : 0.00 - 30.00	30.00A	✓	
		-	DRN-02 : 0.0 - 200.0	200.0A	✓	
	Cmin-T	-	1 - 999	5s	✓	
	Cmax-T	-	1 - 999	5s	✓	
	Cmin-P*	-	DRN-01 : 0.00 - 30.00	10.00A	✓	
		-	DRN-02 : 0.0 - 200.0	50.0A	✓	
	Cmax-P*	-	DRN-01 : 0.00 - 30.00	20.00A	✓	
			DRN-02 : 0.0 - 200.0	150.0A	✓	
PRSS	SCALE-A	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	SCALE-B	-	-9999 - 9999 (with a decimal point/a unit)	0.05MP	✓	
	Pmin	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	Pmax	-	-9999 - 9999 (with a decimal point/a unit)	1.00MP	✓	
	Pmin-T	-	1 - 999	5s	✓	
	Pmax-T	-	1 - 999	5s	✓	
	Pmin-P*	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	Pmax-P*	-	-9999 - 9999 (with a decimal point/a unit)	1.00MP	✓	
ANA	SCALE-a	-	-9999 - 9999 ((with a decimal point/a unit)	4.00mA	✓	
	SCALE-b	-	-9999 - 9999 (with a decimal point/a unit)	20.00mA	✓	
	Amin	-	-9999 - 9999 (with a decimal point/a unit)	-99.99mA	✓	
	Amax	-	-9999 - 9999 (with a decimal point/a unit)	20.00mA	✓	
	Amin-T	-	1 - 999	5s	✓	
	Amax-T	-	1 - 999	5s	✓	
	Amin-P*	-	-9999 - 9999 (with a decimal point/a unit)	4.00mA	✓	
	Amax-P*	-	-9999 - 9999 (with a decimal point/a unit)	16.00mA	✓	
TEMP	Tmin	-	-50 - 200	-50°C	✓	
	Tmax	-	-50 - 200	200°C	✓	
	Tmin-T	-	1 - 999	5s	✓	
	Tmax-T	-	1 - 999	5s	✓	
	Tmin-P*	-	-50 - 200	0°C	✓	
	Tmax-P*	-	-50 - 200	150°C	✓	
DIGI	DELAY-T	-	1 - 999	5s	✓	

*The 2nd layer options marked with * are the Pre-Alarm options and selectable when the "PRE-ALM" option is set to "ON" in the initial setting of the configuration mode.
*In the initialization field, the parameters that return to factory presets via the initialization process (page 94) are checked.

Easy control mode (EVENT 1)

1st layer	2nd layer	3rd layer	Setting range	Default value	Initialization*	Setting
A-POINT	A-CURR	-	DRN-01 : 0.00 - 30.00	0.00A	✓	
		-	DRN-02 : 0.0 - 200.0	0.0A	✓	
	A-PRSS	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	A-ANA	-	-9999 - 9999 (with a decimal point/a unit)	-99.99mA	✓	
B-POINT	B-CURR	-	DRN-01 : 0.00 - 30.00	30.00A	✓	
		-	DRN-02 : 0.0 - 200.0	200.0A	✓	
	B-PRSS	-	-9999 - 9999 (with a decimal point/a unit)	1.00MP	✓	
	B-ANA	-	-9999 - 9999 (with a decimal point/a unit)	20.00mA	✓	
MIN-T	-	-	1 - 999	5s	✓	
MAX-T	-	-	1 - 999	5s	✓	
MIN-P*	-	-	1 - 100	50%	✓	
MAX-P*	-	-	1 - 100	50%	✓	

*The 1st layer options marked with * are the Pre-Alarm options and selectable when the "PRE-ALM" option is set to "ON" in the initial setting of the configuration mode.
*In the initialization field, the parameters that return to factory presets via the initialization process (page 94) are checked.
*The EVENT1 parameters and settings are set effective unless the EVENT2 is established with our special software and is selected over the configuration mode ("DIGITAL" → "DIGI-fn" → "EVNT" option).

Auto control mode (EVENT 1)

1st layer	2nd layer	3rd layer	Setting range	Default value	Initialization*	Setting
NML-PT	N-CURR	-	DRN-01 : 0.00 -30.00	15A	✓	UL: LL:
		-	DRN-02 :0.0 - 200.0	100A	✓	UL: LL:
	N-PRSS	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	UL: LL:
	N-ANA	-	-9999 - 9999 (with a decimal point/a unit)	0.00mA	✓	UL: LL:
BAND-W	-	-	1 - 100	10%	✓	
DELAY-T	-	-	1 - 999	5s	✓	
MIN-P*	-	-	1 - 100	50%	✓	UL: LL:
MAX-P*	-	-	1 - 100	50%	✓	UL: LL:

*The 1st layer options marked with * are the Pre-Alarm options and selectable when the "PRE-ALM" option is set to "ON" in the initial setting of the configuration mode.
*In the initialization field, the parameters that return to factory presets via the initialization process (page 94) are checked.
*The EVENT1 parameters and settings are set effective unless the EVENT2 is established with our special software and is selected over the configuration mode ("DIGITAL" → "DIGI-fn" → "EVNT" option).

Manual control mode (EVENT 2)

1st layer	2nd layer	3rd layer	Setting range	Default value	Initiali-zation*	Setting
CURR	Cmin	-	DRN-01 : 0.00 - 30.00	0.00A	✓	
		-	DRN-02 : 0.0 - 200.0	0.0A	✓	
	Cmax	-	DRN-01 : 0.00 - 30.00	30.00A	✓	
		-	DRN-02 : 0.0 - 200.0	200.0A	✓	
	Cmin-T	-	1 - 999	5s	✓	
	Cmax-T	-	1 - 999	5s	✓	
	Cmin-P*	-	DRN-01 : 0.00 - 30.00	10.00A	✓	
		-	DRN-02 : 0.0 - 200.0	50.0A	✓	
	Cmax-P*	-	DRN-01 : 0.00 - 30.00	20.00A	✓	
			DRN-02 : 0.0 - 200.0	150.0A	✓	
PRSS	SCALE-A	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	SCALE-B	-	-9999 - 9999 (with a decimal point/a unit)	0.05MP	✓	
	Pmin	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	Pmax	-	-9999 - 9999 (with a decimal point/a unit)	1.00MP	✓	
	Pmin-T	-	1 - 999	5s	✓	
	Pmax-T	-	1 - 999	5s	✓	
	Pmin-P*	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	Pmax-P*	-	-9999 - 9999 (with a decimal point/a unit)	1.00MP	✓	
ANA	SCALE-a	-	-9999 - 9999 ((with a decimal point/a unit)	4.00mA	✓	
	SCALE-b	-	-9999 - 9999 (with a decimal point/a unit)	20.00mA	✓	
	Amin	-	-9999 - 9999 (with a decimal point/a unit)	-99.99mA	✓	
	Amax	-	-9999 - 9999 (with a decimal point/a unit)	20.00mA	✓	
	Amin-T	-	1 - 999	5s	✓	
	Amax-T	-	1 - 999	5s	✓	
	Amin-P*	-	-9999 - 9999 (with a decimal point/a unit)	4.00mA	✓	
	Amax-P*	-	-9999 - 9999 (with a decimal point/a unit)	16.00mA	✓	
TEMP	Tmin	-	-50 - 200	-50°C	✓	
	Tmax	-	-50 - 200	200°C	✓	
	Tmin-T	-	1 - 999	5s	✓	
	Tmax-T	-	1 - 999	5s	✓	
	Tmin-P*	-	-50 - 200	0°C	✓	
	Tmax-P*	-	-50 - 200	150°C	✓	

*The 2nd layer options marked with * are the Pre-Alarm options and selectable when the "PRE-ALM" option is set to "ON" in the initial setting of the configuration mode.
*In the initialization field, the parameters that return to factory presets via the initialization process (page 94) are checked.

Easy control mode (EVENT 2)

1st layer	2nd layer	3rd layer	Setting range	Default value	Initiali-zation*	Setting
A-POINT	A-CURR	-	DRN-01 : 0.00 - 30.00	0.00A	✓	
		-	DRN-02 : 0.0 - 200.0	0.0A	✓	
	A-PRSS	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	
	A-ANA	-	-9999 - 9999 (with a decimal point/a unit)	-99.99mA	✓	
B-POINT	B-CURR	-	DRN-01 : 0.00 - 30.00	30.00A	✓	
		-	DRN-02 : 0.0 - 200.0	200.0A	✓	
	B-PRSS	-	-9999 - 9999 (with a decimal point/a unit)	1.00MP	✓	
	B-ANA	-	-9999 - 9999 (with a decimal point/a unit)	20.00mA	✓	
MIN-T	-	-	1 - 999	5s	✓	
MAX-T	-	-	1 - 999	5s	✓	
MIN-P*	-	-	1 - 100	50%	✓	
MAX-P*	-	-	1 - 100	50%	✓	

*The 1st layer options marked with * are the Pre-Alarm options and selectable when the "PRE-ALM" option is set to "ON" in the initial setting of the configuration mode.
*In the initialization field, the parameters that return to factory presets via the initialization process (page 94) are checked.

Auto control mode (EVENT 2)

1st layer	2nd layer	3rd layer	Setting range	Default value	Initiali-zation*	Setting
NML-PT	N-CURR	-	DRN-01 : 0.00 -30.00	15A	✓	UL: LL:
		-	DRN-02 :0.0 - 200.0	100A	✓	UL: LL:
	N-PRSS	-	-9999 - 9999 (with a decimal point/a unit)	0.00MP	✓	UL: LL:
	N-ANA	-	-9999 - 9999 (with a decimal point/a unit)	0.00mA	✓	UL: LL:
BAND-W	-	-	1 - 100	10%	✓	
DELAY-T	-	-	1 - 999	5s	✓	
MIN-P*	-	-	1 - 100	50%	✓	UL: LL:
MAX-P*	-	-	1 - 100	50%	✓	UL: LL:

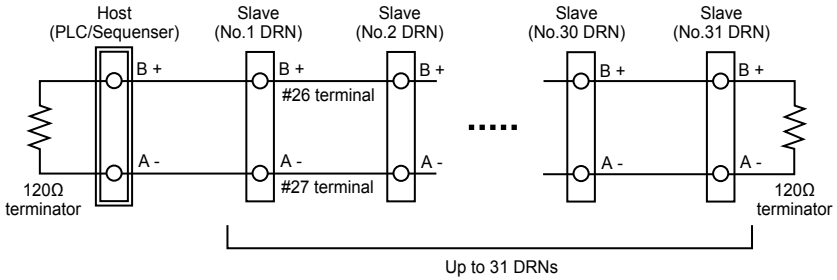
*The 1st layer options marked with * are the Pre-Alarm options and selectable when the "PRE-ALM" option is set to "ON" in the initial setting of the configuration mode.
*In the initialization field, the parameters that return to factory presets via the initialization process (page 94) are checked.

The RS-485 communication allows for not only the data transfer between the DRN and an external sequencer but the DRN setting verification or setting change.

RS-485 communication

The maximum 32 slave DRNs can be connected to a host PLC or a sequencer via the 26th (B+) and 27th (A-) terminals as shown below.

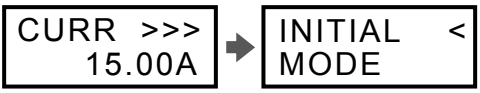
*An 120Ω terminator will be needed at both ends of the PLC - DRNs electrical connection.
*Use the shielded twist pair cable for the electric connection between the devices.



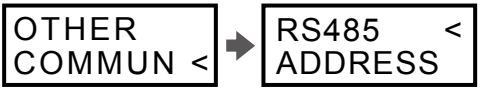
■ Enabling the DRN communication

1 **In any of the main menu options, press and hold the MODE key for 3 seconds**

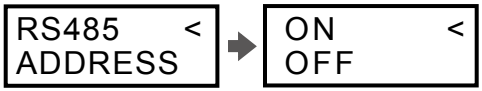
The configuration mode will be called up.



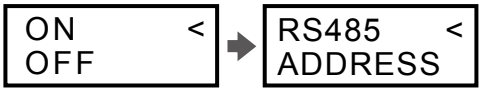
2 **Select the "COMMUN" and push the enter key**



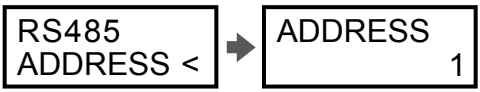
3 **Select the "RS485" and push the enter key**



4 **Select the "ON" and push the enter key**

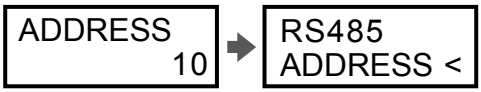


5 **Select the "ADDRESS" (ID) and push the enter key**

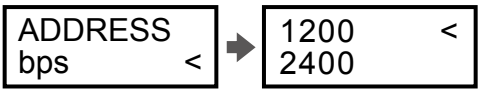


6 **Enter the DRN address between 1-31 and push the enter key**

The DRN address is allocated in the number order connected to the PLC or sequencer.

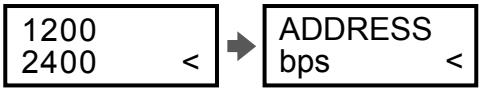


7 **Select the "bps" and push the enter key**

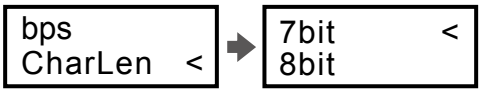


8 **Select a data transfer rate and push the enter key**

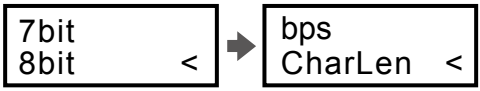
Select "1200", "2400", "4800", "9600", "19200", or "38400" bps.



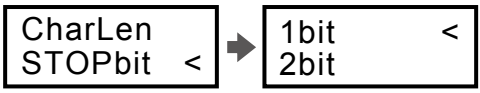
9 **Select the "CharLen" and push the enter key**



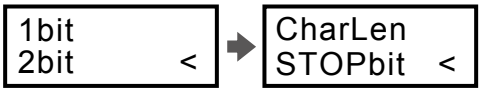
10 **Select the "7bit" or "8bit" and push the enter key**



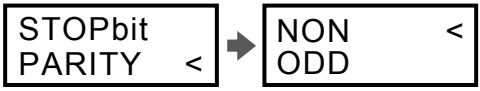
11 **Select the "STOPbit" and push the enter key**



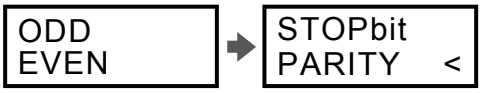
12 **Select the "1bit" or "2bit" and push the enter key**



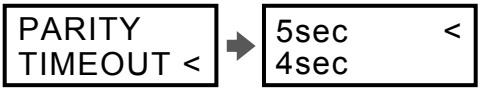
13 **Select the "PARITY" and push the enter key**



14 **Select "NON", "ODD", or "EVEN" and push the enter key**

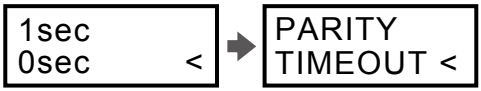


15 **Select "TIMEOUT" and push the enter key**

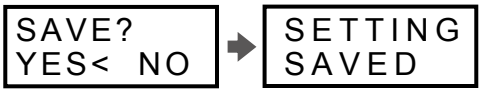


16 **Select a time for communication timeout and push the enter key**

Select "5sec", "4sec", "3sec", "2sec", "1sec", or "0sec" bps.



17 **Push the ESC key twice and save the setting**



The black square will appear on the top right corner of the DRN screen while the DRN communicates with a PLC or sequencer.

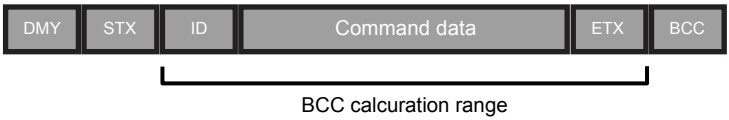
Communication specification

Standard	RS485 (half duplex/1:n)
Communication method	Asynchronous
Baud rate	1200/2400/4800/9600/19200/38400bps
Transmission code	ASCII
Data bit length	7 or 8 bit
Stop bit length	1 or 2 bit
Error detection	Vertical parity (NONE, ODD, EVEN), BCC (Xor)
Flow control	None
Retry	None
Time out	5/4/3/2/1/0 sec

*The underlined options are factory preset settings.

Frame structure

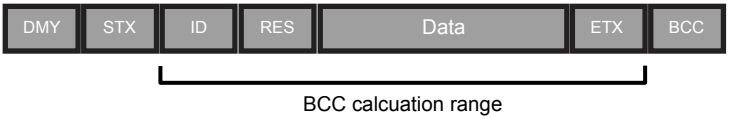
■ Command frame image (a host to DRN)



DMY	Dummy data : 7Fh
STX	Start text : 02h
ID	Slave ID [2 bytes] : "01" - "31", "99" (ASCII)
Command data	Variable length data : (ASCII)
ETX	End text : 03 h
BCC	BCC error detection between ID and EXT [1 byte]

*1 The slave ID is entered at the step 6 of the "Enabling the DRN communication" procedure on page 100 and displayed in decimal notation on the screen of the DRN.

■ Command response frame image (DRN to a host)



DMY	Dummy data : 7Fh
STX	Start text : 02h
ID	Slave ID [2 bytes] : "01" - "31" (ASCII)
RES	Response code [2 bytes] : (ASCII)
Data	Variable length data : (ASCII)
ETX	End text : 03 h
BCC	BCC error detection between ID and EXT [1 byte]

*1 The slave ID is entered at the step 6 of the "Enabling the DRN communication" procedure on page 100.

Response code information (DRN to a host)

Code	Error	Cause
“18”	Frame length error	A command frame length received by a slave has exceeded the max bytes.
“14”	Format error	Any other command data character than "0" - "9" or "A" - "F" is used.
“13”	BCC error	A received BCC is different from a calculated BCC.
“0F”	Command error	An unknown command received by a slave or an unusual parameter
“00”	Successful communication	Command data from a host has been successfully processed by a slave in the communication measuring mode*1
“01”	Successful communication	Command data from a host has been successfully processed by a slave in the communication setting mode*2

*1 In the communication measuring mode, only read commands are executed while write commands are not executed.

*2 In the communication setting mode, only write commands are executed while read commands are not executed.

■ Valid command judgement

The DRN executes error detection and makes an response if:

- the DRN successfully receives the STX and ID data, and
- the DRN receives characters successfully for 2 bytes or more, and
- the DRN successfully receives the ETX and BCC data.

■ Invalid command judgement

The DRN abandons the received data if:

- the DRN has received command data before the STX data is received, or
- the DRN receives a different slave ID from its address, or
- the DRN fails to receive the ETX and BCC data within the time (Time out).

■ Exception of the invalid command judgement

Even when the invalid command judgement condition above is satisfied, the slave does not judge it as invalid:

- If the slave ID sent from a host (PLC) to a slave (DRN) is "99".
  Note the DRN does not send a respond command back to the host (as is the case with an error condition).
- If the #11-18 write commands from a host to a slave is free from error. In this case the DRN executes the write commands.
  Note the DRN does not send a respond command back to the host (as is the case with an error condition).

Command code list

Command code	Read/ Write	Command information	Command data length	Response code	Response data length
“00”	R	TEST UNIT READY	0 byte	“00” (“01”)	0
“03”	R	INQUIRY	0	“00”	4
“04”	W	Shift to communication setting mode	0	“01”	0
“05”	W	Completion of communication setting	0	“01”	0
“11”	W	Configuration mode setting	57	“01”	0
“12”	W	Event 1 Manual control setting	96	“01”	0
“13”	W	Event 1 Easy control setting	38	“01”	0
“14”	W	Event 1 Auto control setting	23	“01”	0
“15”	W	Event 2 Manual control setting	96	“01”	0
“16”	W	Event 2 Easy control setting	38	“01”	0
“17”	W	Event 2 Auto control setting	23	“01”	0
“18”	W	Current/temp reading correction, pressure/analog sensor scaling, digital input function selection	33	“01”	0
“81”	R	Configuration mode setting	0	“00”	57
“82”	R	Event 1 Manual control setting	0	“00”	96
“83”	R	Event 1 Easy control setting	0	“00”	38*¹
“84”	R	Event 1 Auto control setting	0	“00”	23*¹
“85”	R	Event 2 Manual control setting	0	“00”	96
“86”	R	Event 2 Easy control setting	0	“00”	38*¹
“87”	R	Event 2 Auto control setting	0	“00”	23*¹
“88”	R	Current/temp reading correction, pressure/analog sensor scaling, digital input function selection	0	“00”	33
“89”	R	Event log view mode	0	“00”	449
“90”	R	Live readings/alarms	0	“00”	39

*The "00" or "01" response code is sent from a slave to a host if a slave DRN has successfully received a command data from the host PLC or sequencer. See the "Response codes (DRN to a host)" on page 105 as well.

*In an command error (see page 105), the DRN sends back an "error" response code to the host with zero response data length (with no response data).

*¹ The asterisked data length is outputted from the DRN to the PC (host) with four (4) additional bytes which are garbage.

Command code information (a host to DRN)

■ TEST UNIT READY - Command code "00"

Slave condition check command from a host

No.	Data	Data size	Remarks
1	-	0	No data

*A slave sends the response code of "00" back to a host with no response data (when the communication is successfully made with the communication measuring mode)

*A slave sends the response code of ”01” back to a host with no response data (when the communication is successfully made with the communication setting mode)

■ INQUIRY - Command code "03"

No.	Data	Data size	Remarks
1	Software version (Ver. 0.00-9.99)	3	Decimal number system
2	Active sensor check (DRN-01 or -02)	1	0/1
Total		4	

■ Shift to the communication setting mode - Command code "04"

No.	Data	Data size	Remarks
1	-	0	No data

*The command codes between "11" and "18" are the write commands to give a change to the DRN (a slave) settings. However, these commands are not effective unless the communication is in the communication setting mode in advance.

■ Completion of communication setting - Command code "05"

No.	Data	Data size	Remarks
1	-	0	No data

*If a host gave a change to the DRN settings by the command codes between "11" and "18", use the "05" completion of communication setting command to return to the communication measuring mode.

■ Configuration mode setting - Command codes "11" and "81"

No.	Data	Size	Remarks
1	Control mode selection (MAN=0/ EASY=1/ AUTO=2)	1	0-2
2	Rated motor power current entry (0.06-99.99)	4	0032 - 270Fh
3	Rated motor power current entry (0.6-999.9)	4	0032 - 270Fh
4	PRSS input type (CUR = 0/VOL = 1)	1	0/1
5	ANA input type (CUR = 0 / VOL = 1)	1	0/1
6	Temperature input type (Th = 0 / Pt = 1)	1	0/1
7	Digital input function (EXT_RST = 0 / EVENT = 1 / LV_SNSR = 2)	1	0 - 2
8	Digital input logic (OPEN-ON = 0 / CLOS-ON = 1)	1	0/1
9	Alarm output logic (OR = 0 / AND = 1 / TrblFnd = 2)	1	0 - 2
10	Alarm type (ALARM = 0 / PRE-ALM = 1)	1	0/1
11	Pre-Alarm alert indication/alarm output (ON = 0 / OFF = 1)	1	0/1
12	Maintenance reminder (ON = 0 / OFF = 1)	1	0/1
13	1st time maintenance interval	4	0000 - 270Fh
14	2nd time or later maintenance interval	4	0000 - 270Fh
15	Start delay time	3	005 - 3E7h
16	Safe width	4	0000 - 270Fh
17	Judgement width	4	0000 - 270Fh
18	Return width	4	0000 - 270Fh
19	Max discharge pressure (OVER PRESSURE)	4	0000 - 270Fh
20	Decimal place location (max discharge pressure) (0000.= 0, 000.0= 1, 00.00= 2, 0.000= 3)	1	0 - 3
21	PRSS scaling unit (Pa = 0 / kP = 1 / MP = 2)	1	0 - 2
22	RS485 slave ID setting	4	0001 - 001Fh
23	Communication (ON = 0 / OFF = 1)	1	0/1
24	Baud rate (1200 = 0 / 2400 = 1 / 4800 = 2 / 9600 = 3 / 19200 = 4 / 38400 = 5)	1	0 - 5
25	Data bit length (7bit = 0 / 8bit = 1)	1	0/1
26	Stop bit length (1bit = 0 / 2bit = 1)	1	0/1
27	Parity check (NO = 0 / ODD = 1 / EVEN = 2)	1	0 - 2
28	Time out (5sec = 0 / 4sec = 1 / 3sec = 2 / 2sec = 3 / 1sec = 4 / 0sec = 5)	1	0 - 5
Total		57	

■ EVENT1 MANUAL control setting - Command codes "12" and "82"

No.	Data	Size	Remarks
1	Alarm upper limit of motor power current (DRN-01)	3	000 - BB8h
2	Alarm upper limit of motor power current (DRN-02)	3	000 - 7D0h
3	Alarm lower limit of motor power current (DRN-01)	3	000 - BB8h
4	Alarm lower limit of motor power current (DRN-02)	3	000 - 7D0h
5	Alarm upper limit current sensing delay time	3	001 - 3E7h
6	Alarm lower limit current sensing delay time	3	001 - 3E7h
7	Pre-Alarm upper limit of motor power current (DRN-01)	3	000 - BB8h
8	Pre-Alarm upper limit of motor power current (DRN-02)	3	000 - 7D0h
9	Pre-Alarm lower limit of motor power current (DRN-01)	3	000 - BB8h
10	Pre-Alarm lower limit of motor power current (DRN-02)	3	000 - 7D0h
11	Alarm upper limit of discharge line pressure	4	D8F1 - 270Fh
12	Alarm lower limit of discharge line pressure	4	D8F1 - 270Fh
13	Alarm upper limit pressure sensing delay time	3	001 - 3E7h
14	Alarm lower limit pressure sensing delay time	3	001 - 3E7h
15	Pre-Alarm upper limit of discharge line pressure	4	D8F1 - 270Fh
16	Pre-Alarm lower limit of discharge line pressure	4	D8F1 - 270Fh
17	Alarm upper limit of analog sensor input	4	D8F1 - 270Fh
18	Alarm lower limit of analog sensor input	4	D8F1 - 270Fh
19	Alarm upper limit mA/VDC sensing delay time	3	001 - 3E7h
20	Alarm lower limit mA/VDC sensing delay time	3	001 - 3E7h
21	Pre-Alarm upper limit of analog sensor input	4	D8F1 - 270Fh
22	Pre-Alarm lower limit of analog sensor input	4	D8F1 - 270Fh
23	Alarm upper limit of temperature	4	FFCE - 00C8h
24	Alarm lower limit of temperature	4	FFCE - 00C8h
25	Alarm upper limit temperature sensing delay time	3	001 - 3E7h
26	Alarm lower limit temperature sensing delay time	3	001 - 3E7h
27	Pre-Alarm upper limit of temperature	4	FFCE - 00C8h
28	Pre-Alarm lower limit of temperature	4	FFCE - 00C8h
Total		96	

■ EVENT1 EASY control setting - Command codes "13" and "83"

No.	Data	Size	Remarks
1	Alarm upper limit of motor power current DRN-01 (A point)	3	000 - BB8h
2	Alarm upper limit of motor power current DRN-02 (A point)	3	000 - 7D0h
3	Alarm lower limit of motor power current DRN-01 (B point)	3	000 - BB8h
4	Alarm lower limit of motor power current DRN-02 (B point)	3	000 - 7D0h
5	Alarm upper limit of discharge line pressure (A-point)	4	D8F1 - 270Fh
6	Alarm lower limit of discharge line pressure (B-point)	4	D8F1 - 270Fh
7	Alarm upper limit of analog sensor input (A-point)	4	D8F1 - 270Fh
8	Alarm lower limit of analog sensor input (B-point)	4	D8F1 - 270Fh
9	Alarm upper limits sensing delay time	3	001 - 3E7h
10	Alarm lower limits sensing delay time	3	001 - 3E7h
11	Pre-Alarm upper limit of CURR/PRSS/ANA	2	01 - 63h
12	Pre-Alarm lower limit of CURR/PRSS/ANA	2	01 - 63h
Total		42	

*The total data size is outputted from the DRN to the PC (host) with four (4) additional bytes which are garbage.

■ EVENT1 AUTO control setting - Command codes "14" and "84"

No.	Data	Size	Remarks
1	Duty point current with the DRN-01	3	000 - BB8h
2	Duty point current with the DRN-02	3	000 - 7D0h
3	Duty point discharge pressure	4	D8F1 - 270Fh
4	Duty point analog sensor input	4	D8F1 - 270Fh
5	Band width (%)	2	01 - 64h
6	Alarm delay	3	001 - 3E7h
7	Pre-Alarm upper limit of discharge line pressure	2	01 - 63h
8	Pre-Alarm lower limit of discharge line pressure	2	01 - 63h
Total		27	

*The total data size is outputted from the DRN to the PC (host) with four (4) additional bytes which are garbage.

■ EVENT2 MANUAL control setting - Command codes "15" and "85"

No.	Data	Size	Remarks
1	Alarm upper limit of motor power current (DRN-01)	3	000 - BB8h
2	Alarm upper limit of motor power current (DRN-02)	3	000 - 7D0h
3	Alarm lower limit of motor power current (DRN-01)	3	000 - BB8h
4	Alarm lower limit of motor power current (DRN-02)	3	000 - 7D0h
5	Alarm upper limit current sensing delay time	3	001 - 3E7h
6	Alarm lower limit current sensing delay time	3	001 - 3E7h
7	Pre-Alarm upper limit of motor power current (DRN-01)	3	000 - BB8h
8	Pre-Alarm upper limit of motor power current (DRN-02)	3	000 - 7D0h
9	Pre-Alarm lower limit of motor power current (DRN-01)	3	000 - BB8h
10	Pre-Alarm lower limit of motor power current (DRN-02)	3	000 - 7D0h
11	Alarm upper limit of discharge line pressure	4	D8F1 - 270Fh
12	Alarm lower limit of discharge line pressure	4	D8F1 - 270Fh
13	Alarm upper limit pressure sensing delay time	3	001 - 3E7h
14	Alarm lower limit pressure sensing delay time	3	001 - 3E7h
15	Pre-Alarm upper limit of discharge line pressure	4	D8F1 - 270Fh
16	Pre-Alarm lower limit of discharge line pressure	4	D8F1 - 270Fh
17	Alarm upper limit of analog sensor input	4	D8F1 - 270Fh
18	Alarm lower limit of analog sensor input	4	D8F1 - 270Fh
19	Alarm upper limit mA/VDC sensing delay time	3	001 - 3E7h
20	Alarm lower limit mA/VDC sensing delay time	3	001 - 3E7h
21	Pre-Alarm upper limit of analog sensor input	4	D8F1 - 270Fh
22	Pre-Alarm lower limit of analog sensor input	4	D8F1 - 270Fh
23	Alarm upper limit of temperature	4	FFCE - 00C8h
24	Alarm lower limit of temperature	4	FFCE - 00C8h
25	Alarm upper limit temperature sensing delay time	3	001 - 3E7h
26	Alarm lower limit temperature sensing delay time	3	001 - 3E7h
27	Pre-Alarm upper limit of temperature	4	FFCE - 00C8h
28	Pre-Alarm lower limit of temperature	4	FFCE - 00C8h
Total		96	

■ EVENT2 EASY control setting - Command codes "16" and "86"

No.	Data	Size	Remarks
1	Alarm upper limit of motor power current DRN-01 (A point)	3	000 - BB8h
2	Alarm upper limit of motor power current DRN-02 (A point)	3	000 - 7D0h
3	Alarm lower limit of motor power current DRN-01 (B point)	3	000 - BB8h
4	Alarm lower limit of motor power current DRN-02 (B point)	3	000 - 7D0h
5	Alarm upper limit of discharge line pressure (A-point)	4	D8F1 - 270Fh
6	Alarm lower limit of discharge line pressure (B-point)	4	D8F1 - 270Fh
7	Alarm upper limit of analog sensor input (A-point)	4	D8F1 - 270Fh
8	Alarm lower limit of analog sensor input (B-point)	4	D8F1 - 270Fh
9	Alarm upper limits sensing delay time	3	001 - 3E7h
10	Alarm lower limits sensing delay time	3	001 - 3E7h
11	Pre-Alarm upper limit of CURR/PRSS/ANA	2	01 - 63h
12	Pre-Alarm lower limit of CURR/PRSS/ANA	2	01 - 63h
Total		42	

*The total data size is outputted from the DRN to the PC (host) with four (4) additional bytes which are garbage.

■ EVENT2 AUTO control setting - Command codes "17" and "87"

No.	Data	Size	Remarks
1	Duty point current with the DRN-01	3	000 - BB8h
2	Duty point current with the DRN-02	3	000 - 7D0h
3	Duty point discharge pressure	4	D8F1 - 270Fh
4	Duty point analog sensor input	4	D8F1 - 270Fh
5	Band width (%)	2	01 - 64h
6	Alarm delay	3	001 - 3E7h
7	Pre-Alarm upper limit of discharge line pressure	2	01 - 63h
8	Pre-Alarm lower limit of discharge line pressure	2	01 - 63h
Total		27	

*The total data size is outputted from the DRN to the PC (host) with four (4) additional bytes which are garbage.

■ Reading correction/Sensor scaling - Command codes "18" and "88"

No.	Data	Size	Remarks
1	Motor power current reading adjustment DRN-01: 100 times a figure in -2.00 - 2.00A DRN-02: 10 times a figure in -20.0 - 20.0A	4	38 - C8h
2	Pressure sensor scaling 4mA(/1V)@Scale-A	4	D8F1 - 270Fh
3	Pressure sensor scaling 20mA(/5V)@Scale-B	4	D8F1 - 270Fh
4	Analog sensor scaling 4mA(/1V)@Scale-A	4	D8F1 - 270Fh
5	Analog sensor scaling 20mA(/5V)@Sclase-B	4	D8F1 - 270Fh
6	Decimal point location for the analog sensor scaling (0000.=0, 000.0=1, 00.00=2, 0.000=3)	1	0 - 3
7	Analog sensor scaling units (mA = 0 / A = 1 / mV = 2 / V = 3 / Pa = 4 / kP = 5 / MP = 6 / °C = 7 / l = 8 / pH = 9 / br = A / Ps = B / °F = C / % = D / blank = E)	1	0 - E
8	Alarm digital level sensor input sensing delay time	3	001 - 3E7h
9	Thermocouple reading adjustment	4	FFFB - 0005h
10	Pt100RTD reading adjustment	4	FFFB - 0005h
Total		33	

■ Event log view mode - Command codes "89"

No.	Data	Size	Remarks
1	Number of alarm logs	2	00 - 14h
2	The oldest log number (oldest data # is retained)	2	00 - 14h
3	No.1 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
4	No.1 Alarm time (YY/MM/DD / HH/MM)	12	*1
5	No.2 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
6	No.2 Alarm time (YY/MM/DD / HH/MM)	12	*1
7	No.3 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
8	No.3 Alarm time (YY/MM/DD / HH/MM)	12	*1
9	No.4 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
10	No.4 Alarm time (YY/MM/DD / HH/MM)	12	*1
11	No.5 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
12	No.5 Alarm time (YY/MM/DD / HH/MM)	12	*1
13	No.6 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
14	No.6 Alarm time (YY/MM/DD / HH/MM)	12	*1
15	No.7 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6

*1 : YY = 07D0 - 0833h MM = 01 - 0Ch DD = 01 - 1Fh
HH = 00 - 17h MM = 00 - 3Bh

No.	Data	Size	Remarks
16	No.7 Alarm time (YY/MM/DD / HH/MM)	12	*1
17	No.8 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
18	No.8 Alarm time (YY/MM/DD / HH/MM)	12	*1
19	No.9 Alarm patameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
20	No.9 Alarm time (YY/MM/DD / HH/MM)	12	*1
21	No.10 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
22	No.10 Alarm time (YY/MM/DD / HH/MM)	12	*1
23	No.11 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
24	No.11 Alarm time (YY/MM/DD / HH/MM)	12	*1
25	No.12 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
26	No.12 Alarm time (YY/MM/DD / HH/MM)	12	*1
27	No.13 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
28	No.13 Alarm time (YY/MM/DD / HH/MM)	12	*1
29	No.14 Alarm patameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
30	No.14 Alarm time (YY/MM/DD / HH/MM)	12	*1

*1 : YY = 07D0 - 0833h MM = 01 - 0Ch DD = 01 - 1Fh
HH = 00 - 17h MM = 00 - 3Bh

No.	Data	Size	Remarks
31	No. 15 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
32	No.15 Alarm time (YY/MM/DD / HH/MM)	12	*1
33	No.16 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
34	No.16 Alarm time (YY/MM/DD / HH/MM)	12	*1
35	No.17 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
36	No.17 Alarm time (YY/MM/DD / HH/MM)	12	*1
37	No.18 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
38	No.18 Alarm time (YY/MM/DD / HH/MM)	12	*1
39	No.19 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
40	No.19 Alarm time (YY/MM/DD / HH/MM)	12	*1
41	No.20 Alarm parameters (CURR = 0 / PRSS = 1 / ANA = 2 / DIGI = 3 / TEMP = 4 OVERCURR = 5 / OVERPRESS = 6)	1	0 - 6
42	No.20 Alarm time (YY/MM/DD / HH/MM)	12	*1
43	Number of maintenance logs	1	0 - Ah
44	The oldest log number (oldest data # is retained)	1	0 - Ah
45	1st time maintenance interval	4	0000 - 270Fh
46	1st time maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
47	2nd maintenance interval	4	0000 - 270Fh

*1 : YY = 07D0 - 0833h MM = 01 - 0Ch DD = 01 - 1Fh
HH = 00 - 17h MM = 00 - 3Bh

No.	Data	Size	Remarks
48	2nd maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
49	3rd maintenance interval	4	0000 - 270Fh
50	3rd maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
51	4th maintenance interval	4	0000 - 270Fh
52	4th maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
53	5th maintenance interval	4	0000 - 270Fh
54	5th maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
55	6th maintenance interval	4	0000 - 270Fh
56	6th maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
57	7th maintenance interval	4	0000 - 270Fh
58	7th maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
59	8th maintenance interval	4	0000 - 270Fh
60	8th maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
61	9th maintenance interval	4	0000 - 270Fh
62	9th maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
63	10th maintenance interval	4	0000 - 270Fh
64	10th maintenance reminder time (YY/MM/DD / HH/MM)	12	*1
65	Accumulated pump operating time period (Up to 6000000 minutes)	5	00000 - 1869Fh
66	Accumulated controller operating time period (Up to 6000000 minutes)	5	00000 - 1869Fh
67	Maximum maintenance interval (Up to 6000000 minutes)	5	00000 - 1869Fh
68	Total number of MC relay on times	4	0000 - 270Fh
69	Total number of ALM relay on times	4	0000 - 270Fh
Total		449	

*1 : YY = 07D0 - 0833h MM = 01 - 0Ch DD = 01 - 1Fh
HH = 00 - 17h MM = 00 - 3Bh

■ Live readings/Alarm "90"

No.	Data	Size	Remarks
1	Motor power current (DRN-01 : 0.00-30.00)	3	000 - BB8h
2	Motor power current (DRN-02 : 0.0-200.0)	3	000 - 7D0h
3	Discharge line pressure reading	4	D8F1 - 270Fh
4	Analog sensor reading	4	D8F1 - 270Fh
5	Temperature reading	4	FFCE - 00C8h
6	Date and time (YY/MM/DD / HH/MM)	12	YY = 07D0 - 0833h MM = 01 - 0Ch DD = 01 - 1Fh HH = 00 - 17h MM = 00 - 3Bh
7	Alarm parameters (No alarm = 0×00 / CURR = 0×01 / PRSS = 0×02 / ANA = 0×04 / TEMP = 0×08 / DIGI = 0×10 / PUMP STOP = 0×20)	2	0 - 1Fh/20h
8	Alarming state (CURR) (No alarm = 0 / MAX = 1 / MIN = 2 / OVE RCURRENT = 3)	1	0 - 3
9	Alarming state (PRSS) (No alarm = 0 / MAX = 1 / MIN = 2 / OVER PRESSURE = 3)	1	0 - 3
10	Alarming state (ANA) (No alarm = 0 / MAX = 1 / MIN = 2)	1	0 - 2
11	Alarming state (TEMP) (No alarm = 0 / MAX = 1 / MIN = 2)	1	0 - 2
12	Alarming state (DIGI) (No alarm = 0 / ALARM = 1)	1	0 / 1
13	MC relay state (ON = 0 / OFF = 1)	1	0 / 1
14	ALM relay state (ON = 0 / OFF = 1)	1	0 / 1
15	EVENT state (EVENT1 = 0 / EVENT2 = 1)	1	0 / 1
Total		40	

* If the item numbers of 1-5 are disabled, the response command from the slave to the host turns to "---".

Maintenance

This section describes troubleshooting and specifications.

Important

- Follow instructions in this manual for troubleshooting. Do not make unauthorized repair or service beyond the extent of the instructions.
- Risk of electrical shock. Be sure to turn off power to stop the protector and related devices before service is performed.

Error/Alarm conditions

Error messages

The DRN will show one of the following three messages depending on actual erroneous states.

Error code	Error detail	Corrective action
ERROR1	shows up when a DRN reading in the easy or auto control mode has significantly fluctuated and exceeded the safe width in the stability diagnosis phase.	Widen the safe width (SAFEwid) via the configuration mode.
ERROR2	shows up when the DRN motor current reading in the easy or auto control mode is 0.5A or below with the DRN-01 or 5.0A or below with the DRN-02 in the stability diagnosis phase.	The pump has stopped. Run the pump at the duty point motor current. Or the return level of 0.5A or 5.0A has been shifted upwards via the reading adjustment.
ERROR3	shows up when the upper limit and the lower limit are set upside down in the manual control mode.	The upper limit must have a higher value than the lower limit and vice versa.
ERROR4	shows up when a temperature reading with TC or Pt100 has exceeded 200ºC or when the K-type thermocouple is electrically disconnected.	Check a temperature reading is too high or correct disconnected wiring as necessary.
ERROR5	shows up when the duty point parameter of "PRESS" or "ANA" has fallen to zero when the upper/lower limits are set in the auto mode.	Check the duty point parameters of "PRESS" or "ANA".
SYSTEM ERROR	shows up when an out-of-range setting is found from user database when the power is turned ON.	ENT key and then press & hold the ESC and STOP for 3 sec (factory defaulting). Wait mode is called up.

Troubleshooting

First check the following points. If the following measures do not help removing problems, contact us or your nearest distributor.

States	Possible Causes	Corrective Actions
The DRN does not run.	Faulty wiring	Make sure wires are connected properly.
The pump does not run.	Faulty wiring	Make sure wires are connected properly.
	Start-delay time is set too long.	Set it correctly.
	The DRN in the alarm state has stopped the pump.	Reset the alarm state if there is no abnormality.
The DRN sends an alarm when an outlet valve is adjusted.	Air is trapped in the pump.	Expel air.
	The start-delay time is set too short.	Extend the start-delay time to an appropriate period of time.
	Upper/Lower limit sensing delay time is set too short.	Extend the sensing delay time via the setting mode.
The DRN sends an alarm when the pump runs properly.	The operating point of the pump has changed from duty point.	Adjust the upper or lower limit of the pump to the proper levels.
	The upper or lower limit of the pump is no longer correct.	
The DRN doesn't sends an alarm when the pump is in an abnormal condition.	The upper or lower limit of the pump is no longer correct.	Adjust the upper or lower limit of the pump to the proper levels.
	The alarm logic setting is not proper.	Go to the configuration mode to reset the "ALM-LGC" setting option.
The DRN doesn't learn operating points in the easy/auto control mode (ERROR1)	The pump output fluctuates.	Wait until the flow rate becomes constant.
	The safe width (SAFEwid) is set too short.	Go to the configuration mode and increase the SAFEwide value. The factory preset is 50.
Warning display does not disappear.	The pre-alarm upper or lower limit of the pump is not correct.	Correct the limits via the CONFIG mode→Initial→Pre-ALM option.
	The judgement width (JUDGE) for cavitation detection is too short.	Go to the configuration mode and increase the JUDGE value. The factory preset is 70.
"MENTE TIMING" display doesn't disappear.	Maintenance reminder has not been confirmed.	Push the enter key and choose "YES".
Pressure-motor current diagnosis is upset.	Operating point of the pump has shifted.	Run the pump at the duty point.

States	Possible Causes	Corrective Actions
DRN rejects any key entry with "OVER CURRENT" or "OVER PRESSURE" display.	Rated motor power current (Rated-I) or rated discharge pressure (Rated-P) is not correct.	Initialize the DRN and enter proper values.
The "OVER CURRENT" status repeats.	The pump is turned on before the DRN returns to the wait mode.	Turn on the pump after the DRN is in the wait mode.
DRN current reading doesn't match the reference ammeter reading.	The current reading is adjusted wrong.	Use reading adjustment. See page 79. Factory defaulting (all settings) may be necessary before adjustment. In this case, see page 94.
DRN current reading is low or unstable.	A clamp sensor is not attached securely.	Make sure the power line is caught by the latch of the sensor and won't move at all.
DRN temperature reading is upset.	DRN temperature reading doesn't match the reference thermometer reading.	Use reading adjustment. See page 80. Factory defaulting (all settings) may be necessary before adjustment. In this case, see page 94.
	Temperature sensor type is set wrong.	Go to the GONFIG mode→Initial→TMPsensor to select "Th" or "Pt" according to actual sensor type.
DRN pressure reading is upset.	Pressure sensor type is set wrong.	Go to the GONFIG mode→Initial→PRS I/V to select "P-CURR" or "P-VOLT" according to actual sensor type.
DRN analog sensor reading is upset.	Analog sensor type is set wrong.	Go to the GONFIG mode→Initial→ANA I/V to select "A-CURR" or "A-VOLT" according to actual sensor type.
DRN digital sensor reading is upset.	Digital logic setting is set wrong.	Go to the GONFIG mode→Digital→DIGI-IN to select "OPEN-ON" or "OPEN-CLOSE" according to actual use.
Date & Time in the main menu doesn't move.	The DRN is in an alarm state.	Cancel the alarm state.
DRN can not communicate with a host PLC/ sequencer.	Faulty wiring	Make sure RS485 wires are connected correctly.
	Communication setup is set wrong.	Go to the GONFIG mode→COMMUN to put it right.
DRN clock is cleared.	Built-in battery is dead.	-
Alarm time logged is note updated.		-

Inspection

Perform daily and periodic inspection to keep pump performance and safety.

Periodic inspection

The controller itself requires very little maintenance. Wipe with a damp cloth and a neutral detergent if necessary.
Do not clean the pump or nameplate with a solvent such as benzine or thinner. This may discolour the pump or erase printing.
In a humid environment, take apart the DRN every year to see if its inside is wet or not. An wet electrical connection or part can reduce the insulation resistance and adversely affect DRN parameter reading.

Specifications/Outer dimensions

Specifications

Information in this section is subject to change without notice.

■ Protector

Rated power voltage	100-240VAC ±10% 50/60Hz
Ambient temperature	0-40°C
Storage temperature	-20 - 60°C
Ambient humidity	35-85%RH (non-condensing)
DRN-01 type	CT1: 0.50-30.00A
DRN-02 type	CT2: 5.0-200.0A
Analog input 1	4-20mA / 1-5VDC
Analog input 2	4-20mA / 1-5VDC
K type TC input	-50 - 200ºC K type TC
Pt100 RTD input	-50 - 200ºC Pt100 RTD
Level sensor input	No voltage contact signal (shared with the external reset signal)
MC contact output	250VAC 8A resistive load 1a
ALM contact output	250VAC 8A resistive load 1c
Event log view mode	Past event logs
Standards	UL Std.61010-1: 2012/05/11 CAN/CSA Std. C22.2 No.61010-1-12: 2012/05/11

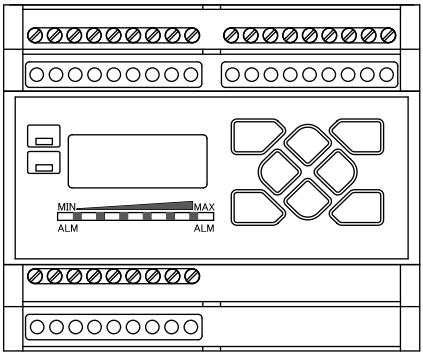
■ Weight

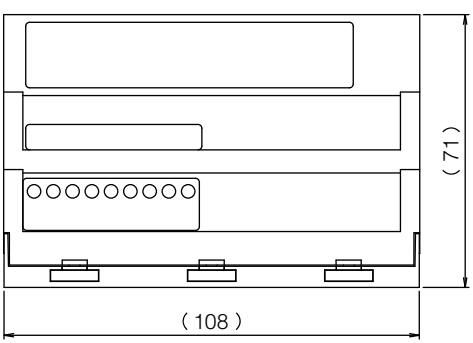
Part names	Weight
DRN	0.38kg

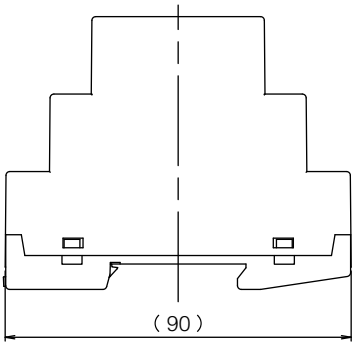
Outer dimensions

■ Protector

Unit : mm

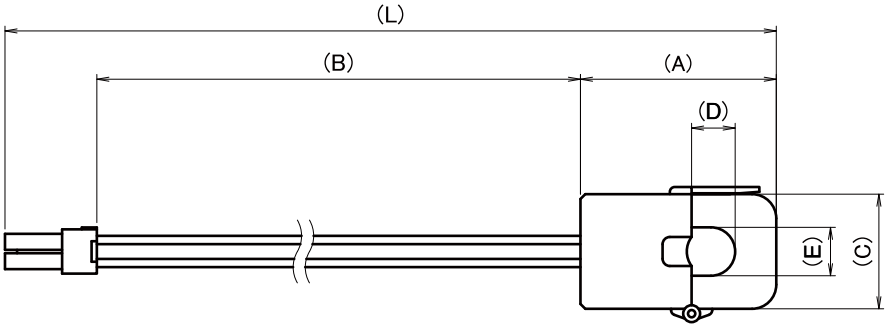




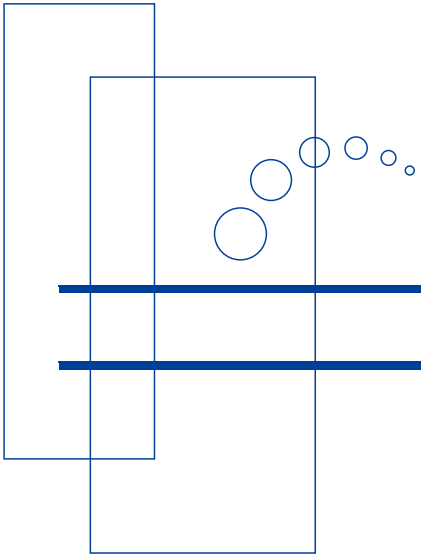


■ Motor power current sensor

Unit : mm



	L	A	B	C	D	E	Model codes
JS10FL	209.5	40.5	150	23.7	9	10	DRN-01
JS24FL	284	65	200	45	24	24	DRN-02



https://www.iwakipumps.jp

IWAKI CO.,LTD. 6-6 Kanda-Sudacho 2-chome Chiyoda-ku Tokyo 101-8558 Japan
TEL: +81 3 3254 2935 FAX: +81 3 3252 8892

European Headquarter / IWAKI Europe GmbH
TEL: +49 2154 9254 0 FAX: +49 2154 9254 48

Germany / IWAKI Europe GmbH
TEL: +49 2154 9254 50 FAX: +49 2154 9254 55

The Netherlands / IWAKI Europe GmbH (Netherlands Branch)
TEL: +31 74 2420011 FAX: +49 2154 9254 48

Italy / IWAKI Europe GmbH (Italy Branch)
TEL: +39 0445 561219 FAX: +39 0445 569088

Spain / IWAKI Europe GmbH (Spain Branch)
TEL/FAX: +34 934 741 638

Poland / IWAKI Europe GmbH (East Europe Branch)
TEL: +48 12 347 0755 FAX: +48 12 347 0900

Belgium / IWAKI Belgium N.V.
TEL: +32 13 670200 FAX: +32 13 672030

Denmark / IWAKI Nordic A/S
TEL: +45 48 242345

Finland / IWAKI Suomi Oy
TEL: +358 10 201 0490

France / IWAKI France S.A.
TEL: +33 1 69 63 33 70 FAX: +33 1 64 49 92 73

Norway / IWAKI Norge AS
TEL: +47 23 38 49 00

Sweden / IWAKI Sverige AB
TEL: +46 8 511 72900

U.S.A. / IWAKI America Inc.
TEL: +1 508 429 1440 FAX: +1 508 429 1386

Argentina / IWAKI America Inc. (Argentina Branch)
TEL: +54 911 6477 4116

Brazil / IWAKI Do Brasil Comercio De Bombas Hidraulicas LTDA.
TEL/FAX: +55 19 3244 5900

Singapore / IWAKI Singapore Pte Ltd.
TEL: +65 6316 2028 FAX: +65 6316 3221

Indonesia / IWAKI Singapore (Indonesia Office)
TEL: +62 21 6906606 FAX: +62 21 6906612

Malaysia / IWAKIm SDN. BHD.
TEL: +60 3 7803 8807 FAX: +60 3 7803 4800

Australia / IWAKI Pumps Australia Pty Ltd.
TEL: +61 2 9899 2411 FAX: +61 2 9899 2421

China (Hong Kong) / IWAKI Pumps Co., Ltd.
TEL: +852 2607 1168 FAX: +852 2607 1000

China (Guangzhou) / GFTZ IWAKI Engineering & Trading Co., Ltd.
TEL: +86 20 84350603 FAX: +86 20 84359181

China (Shanghai) / IWAKI Pumps (Shanghai) Co., Ltd.
TEL: +86 21 6272 7502 FAX: +86 21 6272 6929

Korea / IWAKI Korea Co., Ltd.
TEL: +82 2 2630 4800 FAX: +82 2 2630 4801

Taiwan / IWAKI Pumps Taiwan Co., Ltd.
TEL: +886 2 8227 6900 FAX: +886 2 8227 6818

Thailand / IWAKI (Thailand) Co., Ltd.
TEL: +66 2 322 2471 FAX: +66 2 322 2477

T925-5 '23/05