Winthrop, Shelby

To: Lee, Weston
Subject: RE: Leachate pump operations manual

From: Lee, Weston
Sent: Wednesday, March 14, 2018 4:13 PM
To: Winthrop, Shelby
Cc: McWilliams, Clark; Reynolds, Benjamin; Zweifel, Jarrod
Subject: Leachate pump operations manual

Shelby,

Could you put this into the SW database for permit number 0249-S1-R2 AFIN 03-00051

S:\Facilities\AFIN-01_to_25\03-00051_Nabors Landfill\NABORS Closure_AFT Work.pdf

Thank you,
-Wes

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AFIN: 03-00051

PMT#: 0249-S1-R2

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ADVANCED FLUID TECHNOLOGIES





Project Manual – Specification
Closure of Inactive N.A.B.O.R.S. Landfill

1320 Landfill Road, Mountain Home, Arkansas 72653

Project Number 930160R

Prepared For:
Kolb Grading, LLC
5731 Westwood
St. Charles, MO 63304

Prepared By:
Advanced Fluid Technologies, Inc.
7801 Warden Road
Sherwood, AR 72120

INDEX

- Control Panels and Supporting Documents
- Fiberglass Tanks
- Concrete Containment and Vent Vaults
- Pumps and Motors
- High Density Poly Pipe and Fittings
- Heat trace and Insulation
- Field Records
- Force Main Leak Test Records

Leachate Collection System

Operators & Troubleshooting Guide

Equipment ID	Description	JOB#	Stock#
LCS1 – LCS 9	Control Panel	93041601R	AFT612001

Rev	Rev Date	Description of Change	Revised By
1	8/29/17	Original Document	M. Rankins

7801 Warden Road * Sherwood, AR 72120
Phone: (501) 835-3200 Fax: (501) 835-3251
mailto:sales@advancedfluidtech.com

FORWORD

The design, material, and workmanship incorporated in the construction of Leachate Collection Systems makes them capable of giving long, trouble-free service. The life and satisfactory service of any system, however, is enhanced and extended by correct application, proper installation, periodic inspection and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and the correct methods of operating and maintaining this system.

TABLE OF CONTENTS

SECTION 1 – INSTALLATION PAGE

1-A Description of system 2
I-B Uncrating & Inventorying Component/Kits 3
I-C Determining System Location 3

SECTION II – PREPRATION FOR OPERATION

II-A Initializing Power 4
II-B Checking voltage and phase 4
II-C Documentation 4

SECTION III – OPERATION

III-A Starting the Pump 5
III-B Initial Inspection after Startup 5

SECTION IV – CARE AND MAINTENANCE

IV-A Inspections 6

SECTION V – TROUBLE CHECK LIST

V-A Pump Not Working or Pumping 7
V-B No power 7
V-C Lights not Flashing 7

SECTION V1 – RECOMMENDED SPARE PARTS

V1-A Spare parts for every 10 Systems 8

SECTION V11 – FIGURES

V11-Fig 1 Installation Record at Startup 9
V11-Fig 2 Drawing WM-1A-1 11
V11-Fig 3 Drawing WM-1A-2 12
V11-Fig 3 Drawing WM-1A-3 13
V11-Fig 3 Drawing WM-1A-4 14

SECTION 1 – INSTALLATION

1-A Description of system

Furnish one AFT Simplex Control Panel to operate a pump motor and auxiliary equipment in manual or automatic mode. This control panel enclosure shall be NEMA type 4x.

The enclosure shall be equipped with a window in the outer door, an inner door, and a tamper resistant latch. The NEMA type 4x enclosure will be white powder coated stainless steel.

The control system will operate from a __230__ Volt, 60 Hertz, single phase power supply. Pump control components will be sized to operate a pump motor of specified horsepower.

UL Listed, UL 508A Industrial Control Panels.

The control panel shall include the following as standard features:

Main Disconnect Breaker: The main disconnect breaker shall be __20__ Amp rated.

"Hand-Off-Auto" Selector Switch: Allows manual or automatic operation of the pump motor. The selector switch shall be a heavy duty, oil tight, NEMA 4 rated switch mounted on the inner door.

Variable Frequency Drive: The variable frequency drive shall be sized to safely operate pumps ranging from __0.25__ to __3__ horsepower.

Control Transformer: A transformer shall be installed to provide for easier and safer field wiring of accessories. It shall lower incoming voltage to 24 Volts.

Identification Strobes: Three strobe lights will be mounted directly on top of the control panel. Green strobe shall indicate that the pump is running. Red light shall indicate that the liquid level is above point of compliance. Amber light shall indicate a failure of a component in the control panel.

Level Simulator: The level simulator shall be mounted on the inner door. The level simulator is a built-in test circuit designed to simulate a 4-20mA load to assist in level meter setup and troubleshooting.

Surge Arrester: Shall be grounded, metal-to-metal. When properly grounded, the surge arrestor will protect electrical equipment against all electrical surges. An additional surge arrestor shall be installed for additional protection specifically for the submersible pressure transmitter.

Terminal Strip: A labeled and numbered terminal strip provides easy connection of external components.

Corrosion Inhibitor Emitter: Inclusion of an industrial corrosion inhibitor emitter shall protect internal components of control panel from corrosion for up to one year and shall be replaceable.

Other options are available to meet specific needs.

System Logic and Function
The controller is designed to start and stop a pump using a programmable logic controller with a submersible pressure transmitter. The pump starts at the pump start level set point and continues to run until the liquid level decreases to the pump stop level set point as programmed in the logic controller. If the liquid level rises to the high level alarm set point, the red strobe beacon will begin flashing. If the liquid level rises to the high-high level fail-safe set point, the pump motor will shut off. The pressure transmitter level sensor shall have a range of 0 to 23.1 feet with a 4-20 mA output signal.

I-C Uncrating & inspecting Panels

- Remove plastic wrapping
- Check for dents, scratches, broken lights, ect..

I-D Determining System Location

- There are two types of mounting the panel, directly to the headwall or free standing.
- If mounting to the headwall, vapor/gas seal-offs must be used to prevent landfill gas from entering the cabinet.
- If mount free standing , it is recommended that the panel be a minimum of 10 feet from the raiser pipe

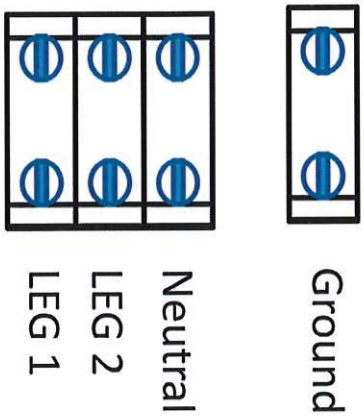
I-D Wiring up the control panel from a commercial source.

- All connections should be performed by a licensed electrician or trained service person.

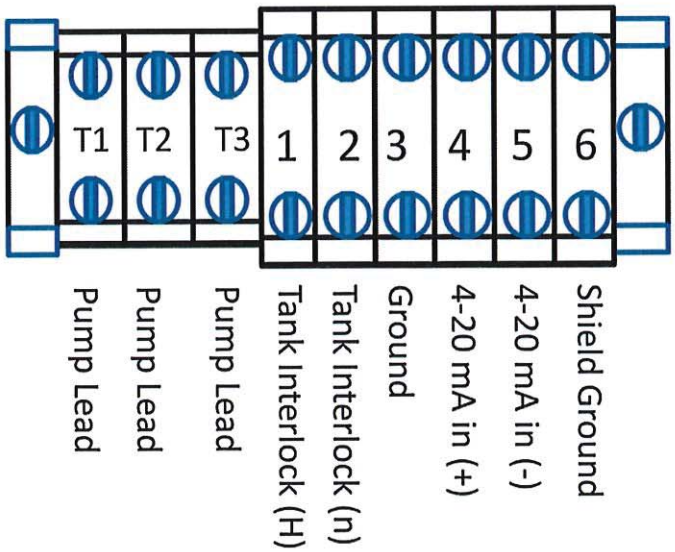
Warning

Hazardous voltages exist within enclosure. Service should be performed only by trained service personnel.

Power Distribution Bus



Terminal Block -1

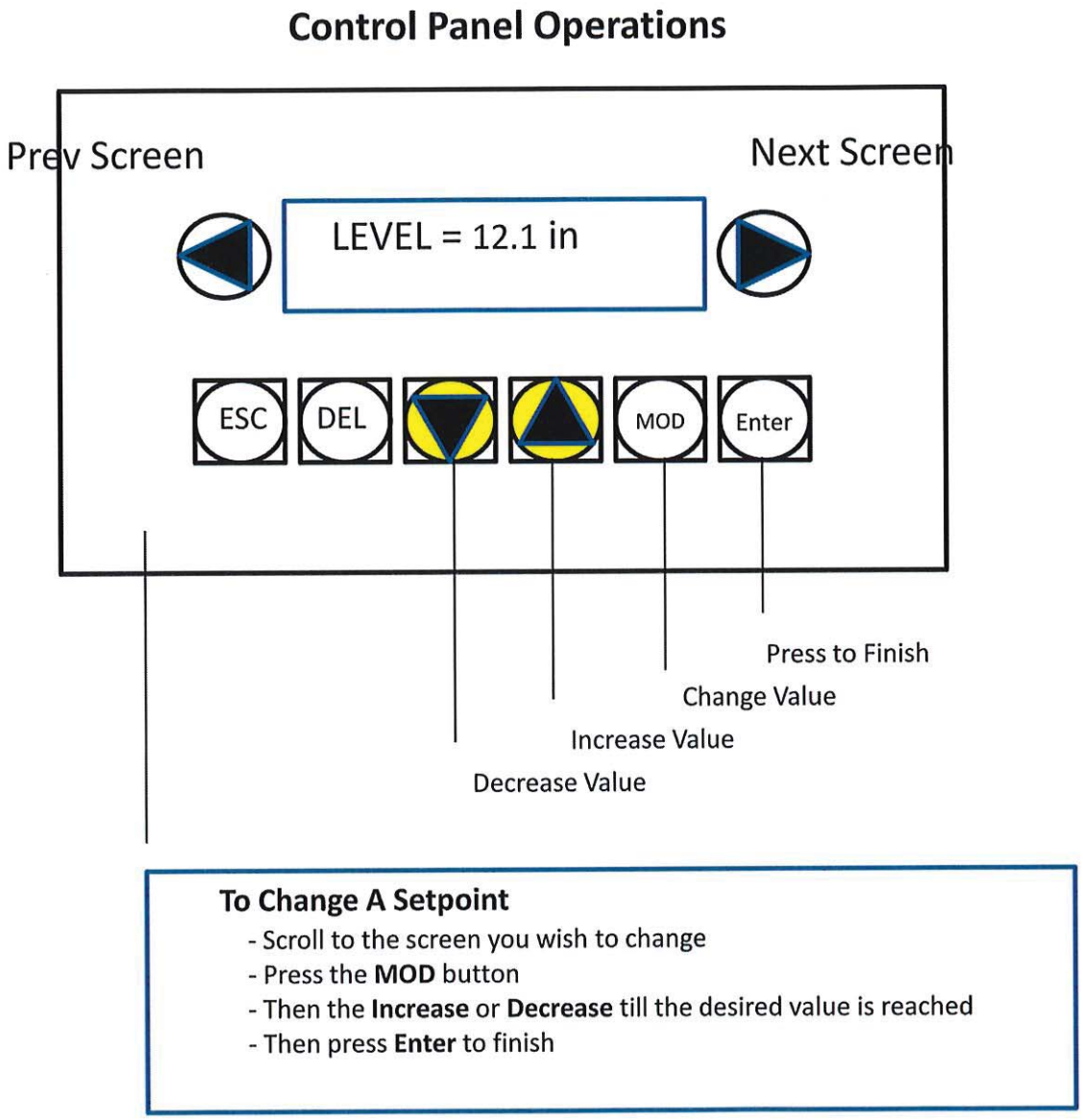


SECTION II – PREPRATION FOR OPERATION

II-A Preparation for power-up

- Ensure all power connection are tight.
- Ensure all breakers are in the off position
- Turn on power to the control panel, record readings on **Installation Record at Startup (Fig 1).**
- Follow the steps on **Installation Record at Startup**

II-B Set operating parameters.



To Change A Setpoint

- Scroll to the screen you wish to change
- Press the **MOD** button
- Then the **Increase** or **Decrease** till the desired value is reached
- Then press **Enter** to finish

1 = Level
2 = Pump On Setpoint
3 = Pump Off Setpoint
4 = POC Set Point
5 = Low level Setpoint
6 = Sensor Fail Setpoint
7 = XDucer Select
8 = Total Run Hours ——— 1 = 0-5 PSI, 2 = 0-10 PSI, 3 = 0-15 PSI
9 = 24 Hr Run time
10= Alarms

SECTION III – OPERATION

III-A Starting the Pump

- Place the pump HAND/OFF/AUTO selector switch in the AUTO position, Pumping system is now in operation.

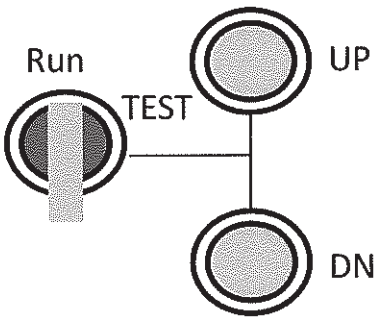
III-B Initial Inspection after Startup

- After 30 minutes of operation, check to see if level is dropping. If yes place system in a schedule maintenance program. If not, see trouble shooting

SECTION IV – CARE AND MAINTENANCE

IV-A Inspections:

- Quarterly
  - Run simulation test to see if strobes flash, pump starts and stops at the proper set points
  - Use to Test Set Points instructions below.
- Annual Inspections
  - Check all quarterly inspection items
  - Check panel for damage, Rust, loose connections, broken lights, ect.)



TO TEST SETPOINTS

- Turn and hold switch in **TEST** position
-- Press the **UP/DN** button to simulate level Changes
-- When complete the switch should return to **RUN** automatically

SECTION V – TROUBLE CHECK LIST

V-A Pump not working or pumping

Cause	Possible Solution
Selector switch	Must be placed in either Hand or Auto
Tank Inter-lock	Tank full, empty tank
Low level Alarm	Make sure the sump has liquid
Pump Fault	Check wiring drive to motor, Meg Motor, motor should have a minimum of 5 MΩ Replace motor Replace drive

V-B Pump running with no liquid

Cause	Possible Solution
Low level	Low level setting set to low
4-20 ma	4-20ma level signal bad, replace level probe
Pump plugged or bad	Clean or replace pump

V-B Lights not flashing

Cause	Possible Solution
Strobe Bunt-out	Replace strobe, see replacement parts for Part# Replace strobe unit, see replacement parts for Part #

V1--Recommended Spare Parts

V1-A Recommended Spare Parts needed every 10 systems.

Item #	AFT Part #	Description	QTY Needed	UOM
1	341007	Franklin 4" Submersible Motor, 0.5HP, 230V 2w, Single Phase, STD WW	1	EA
2	301003	4" Submersible Pump Head, 25gpm, 316ss	1	EA
3	611011	Acculevel/81335/10 PSIG/mA+RS485/150'PE Cable OP13/0.25%	1	EA
4	611025	Altivar, VFD 3 HP, 230 v Single Phase to 230 v Three phase	1	EA
5	631001	Flash Tube Assembly (Strobe Light Replacement Bulb)	2	EA
6	631008	Strobe Light, Low Profile, 120 volts, Pipe mount full assembly	1	EA

SECTION V11 – Figures

Figure 1

Installation Record at Startup

Project Job Number_____ Startup Date: _____

Installer's Name_____

Sump ID_____ Choose an item. Choose an item.

Side Slope Information: **Vertical Information:**

Slope__:1

Riser Diameter _____ Inches Sump Diameter _____ Inches

Riser Length _____ Feet Sump Depth _____ Feet

Vertical Depth _____ Feet

Pump & Motor Information:

Mfg_____ Model #_____ S/N _____

GPM_____ @ _____ Ft. TDH

Motor Mfg _____ Model _____ S/N _____

Hp _____ Voltage _____ Phase_____ FLA _____

Motor Cable # of Conductors _____ Wire Size AWG _____ Length _____

Power Service Supply:

Breaker Size_____ Wire Size AWG_____ Length _____

Incoming Voltage;
No Load L1-L2 _____ L2-L3 _____ L1-L3 _____ % Unbalance _____

Full Load L1-L2 _____ L2-L3 _____ L1-L3 _____

Full Load Amps L1 _____ L2 _____ L3 _____ % Unbalanced _____

Motor Run Amps: L1_____ L2 _____ L3_____ % Unbalanced _____

Xducer/Float Information:

Xducer Mfg_____Serial # _____ PSI Rating _____

Float Mfg _____ Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG _____ Model # _____ Serial # _____

Panel Style Simplex/Duplex/Lead Lag (Circle One)

Set Points:

Pump On _____ Pump Off_____ POC_____

Low Level _____ Sensor Fail _____ Xducer _____

VFD Set Hz _____ Motor Starter Overload Setting _____

Float 1 ____ Inches Float 2 _____ Inches Float 3 _____ Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

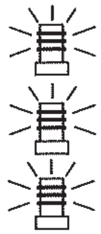
T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

	MFE	DISPLAY
POINT OF COMPLIANCE =		
PUMP ON SETPOINT =		
BOTTOM OF LINER =		
PUMP OFF SETPOINT =		
LOW LEVEL ALARM =		
BOTTOM OF SUMP =		



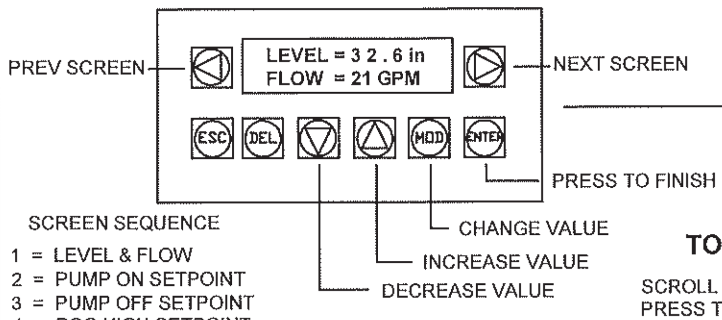
ABOVE POC = FLASHING RED BEACON

ALARMS /FAULT = FLASHING AMBER BEACON

PUMP RUNNING = FLASHING GREEN BEACON

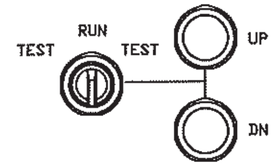
LEVEL is in INCHES
FLOW is in GPM

OPERATOR CONTROL



SCREEN SEQUENCE

1 = LEVEL & FLOW
2 = PUMP ON SETPOINT
3 = PUMP OFF SETPOINT
4 = POC HIGH SETPOINT
5 = POC LOW SETPOINT
6 = SENSOR FAIL
7 = XDUCER SELECT — 1 = 0-5 psi; 2 = 0-10 psi; 3 = 0-15 psi
8 = ETM / DC
10 = ALARMS

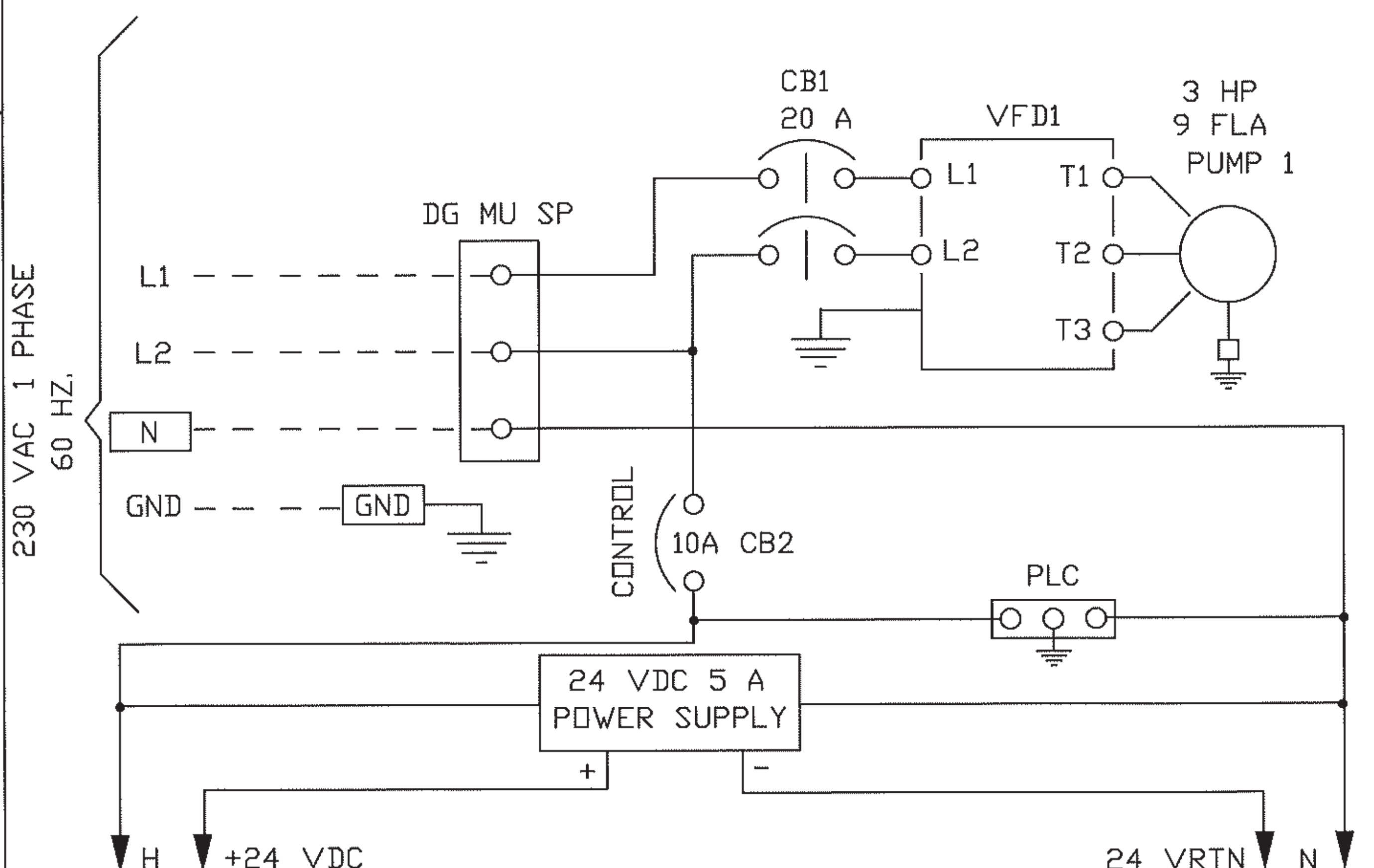


TO TEST SETPOINTS

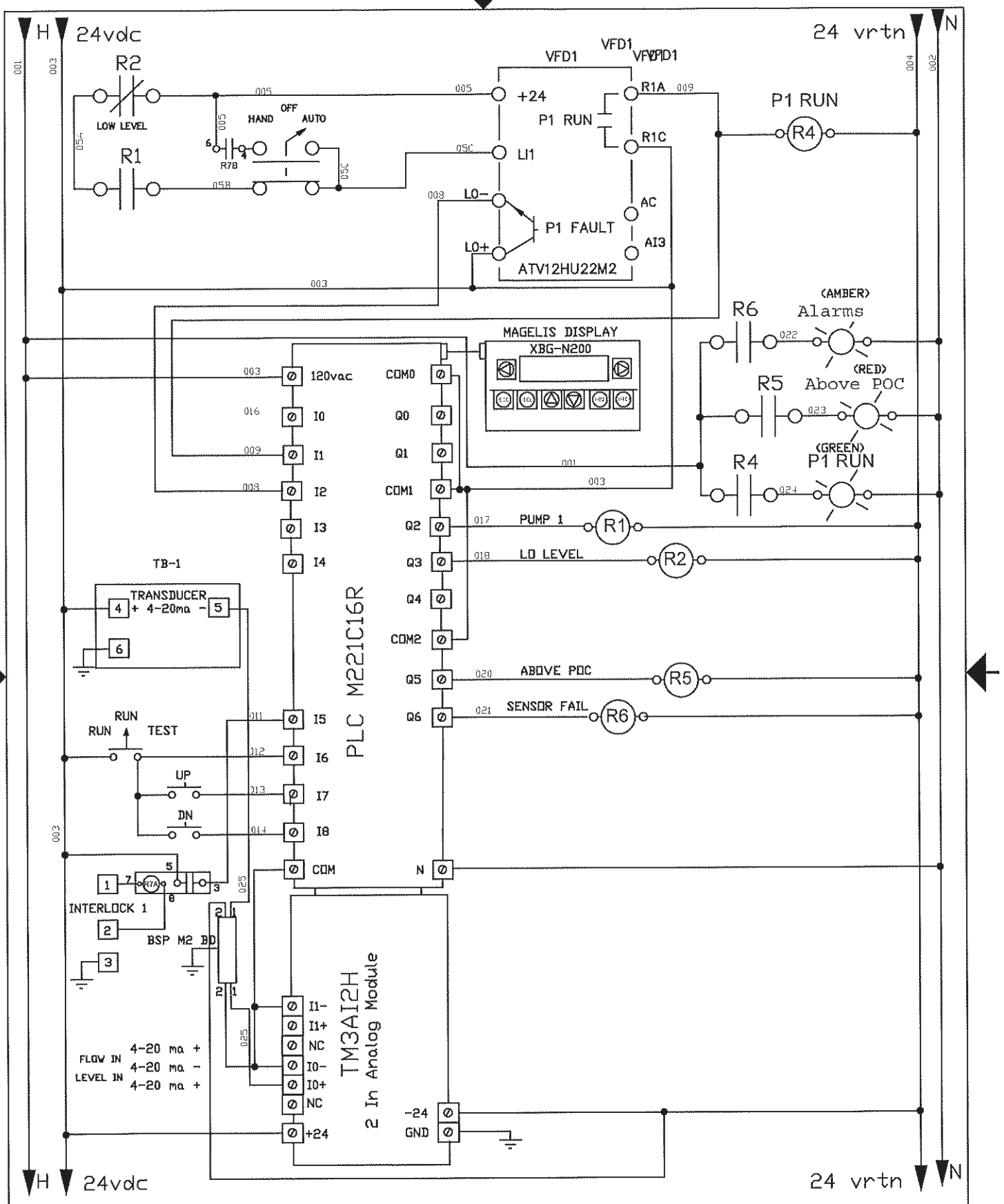
TURN AND HOLD SWITCH IN TEST POS.
PRESS THE UP / DN BUTTONS TO SIMULATE LEVEL CHANGES

TO CHANGE A SETPOINT

SCROLL TO THE SCREEN YOU WISH TO CHANGE-
PRESS THE MOD BUTTON, THEN THE INCREASE OR
DECREASE BUTTONS TILL THE DESIRED VALUE IS
REACHED - THEN PRESS ENTER TO FINISH



Advanced Fluid Technologies SHERWOOD, AZ 531-835-3200		**WM-1A**			
		SIZE	Filename WM_1A_1	DWG NO. 10350	REV
DATE 2/16/2012	DRAWN BY: TLI	SCALE		SHEET 1 of 4	



Advanced Fluid Technologies	**WM-1A**		
Sherwood, AR (501) 835-3200	SIZE	Filename: WM_1A_2	DWG NO. 10350 REV
DATE 2/16/2012	DRAWN BY: TLI	SCALE	SHEET 2 of 4

	MFE	DISPLAY
POINT OF COMPLIANCE =		
PUMP ON SETPOINT =		
BOTTOM OF LINER =		
PUMP OFF SETPOINT =		
LOW LEVEL ALARM =		
BOTTOM OF SUMP =		

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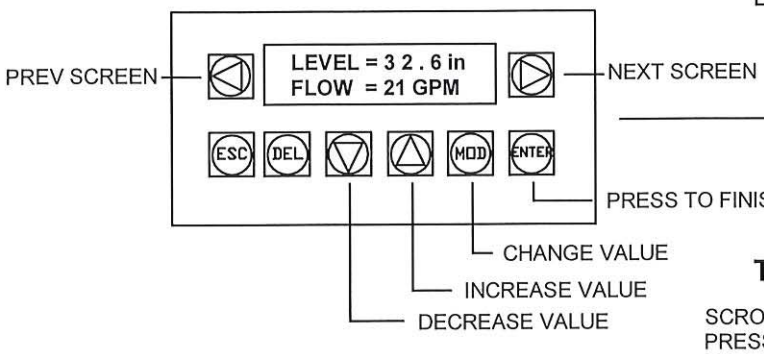
ALARMS / FAULT = FLASHING AMBER BEACON

PUMP RUNNING = FLASHING GREEN BEACON

OPERATOR CONTROL



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SCROLL TO THE SCREEN YOU WISH TO CHANGE- PRESS THE MOD BUTTON, THEN THE INCREASE OR DECREASE BUTTONS TILL THE DESIRED VALUE IS REACHED - THEN PRESS ENTER TO FINISH

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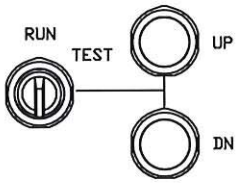

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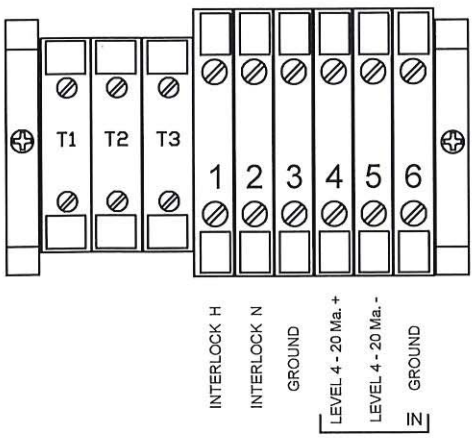


CONNECTION DETAIL TB-1

QUICK TROUBLESHOOTING GUIDE

For the Pump to run you MUST HAVE :
HOA in AUTO or HAND
a Pump Call (Output #2 on the PLC)
No Faults
the Low Level Alarm must be Clear
and the Interlock Input must be Connected

IF	LOOK FOR
NO Pump Call----	Interlock Missing 4-20 ma Level Signal Missing or Bad Pump Fault
Pump Fault-------	Fault Line from Drive (input #2 on PLC) Check wiring from Drive to Motor Check Drive Settings - if correct, Replace Drive

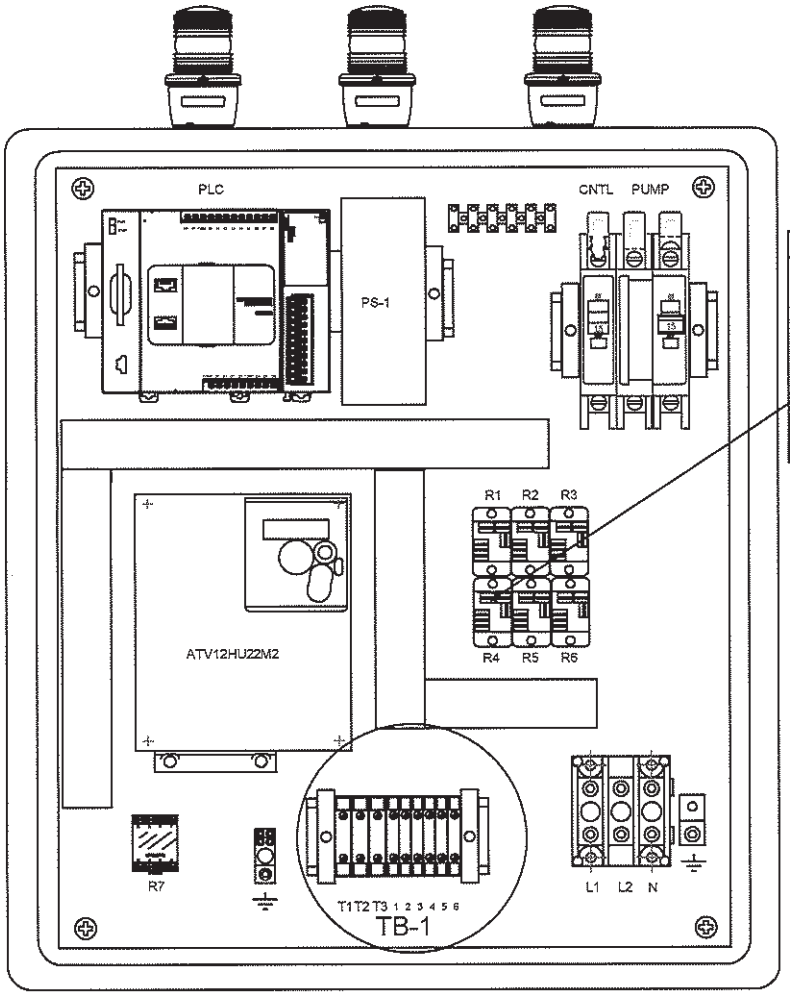
Advanced Fluid Technologies
SHERWOOD, AZ 531-835-3200

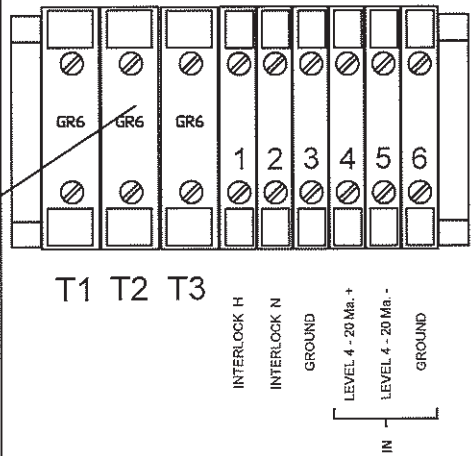
WM-1A

SIZE	Filename	DWG NO.	REV
	WM_1A_3	10350	

EXTEMPLATE_2.JPG

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED





CONNECTION DETAIL TB-1

E:\Temp\AFT_2.JPG

Advanced Fluid Technologies
SHERWOOD, AR. 531-835-3200

WM-1A ENCLOSURE LAYOUT

SIZE	FSCM NO.	DWG NO.	REV
A	WM_1A_4	10350	
SCALE		SHEET 4 of 4	

Product Data Sheet

ATV12HU22M2

AC Drive, 3 HP, 230v 1 phase in, 230v out

Technical Characteristics

Ampere Rating	10A
Application	Variable & Constant
Conformal Coating	Yes
Embedded Communication	Modbus
Heatsink	Yes
Enclosure Rating	Open
Degree of Protection	IP20
Horsepower Rating	3HP
Motor Power Rating	2.2kW
Input Voltage	230Vac
Marketing Trade Name	Altivar 12
Output Voltage	230Vac
Input Phase	1-Phase
Output Phase	3-Phase
Type	ATV12

Shipping and Ordering

Category	22042 -
Discount Schedule	CP4B
GTIN	00785901897491
Package Quantity	1
Weight	4.31 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	ID

document.

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Altivar 312

Variable speed drives for asynchronous motors

Programming manual

07/2014

BBV46385

www.schneider-electric.com

Schneider Electric

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation, and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Contents

Important information 4
Before you begin 5
Documentation structure 7
Software enhancements 8
Steps for setting up the drive 9
Setup - Preliminary Recommendations 10
Factory configuration 11
Basic functions 12
Remote display terminal option, ATV31 14
Remote graphic display terminal option, ATV61/ATV71 15
Remote display terminal option, ATV12 19
Structure of the parameter tables 20
Compatibility of functions 21
List of functions that can be assigned to inputs/outputs 23
List of functions that can be assigned to the Network and Modbus control word bits 25
Checklist 26
Programming 27
[SPEED REFERENCE] (rEF-) menu 31
[SETTINGS] (SEt-) menu 32
[MOTOR CONTROL] (drC-) menu 41
[INPUTS / OUTPUTS CFG] (I-O-) menu 47
[COMMAND] (CtL-) menu 50
[COMMAND] (CtL-) menu 61
[APPLICATION FUNCT.] (FUn-) menu 62
[FAULT MANAGEMENT] (FLt-) menu 91
[COMMUNICATION] (COM-) menu 98
[MONITORING] (SUP-) menu 100
Migration ATV31 - ATV312 105
Diagnostics and troubleshooting 106
Index of functions 111
Index of parameter codes and customer settings 112

Important information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or equipment damage.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death, serious injury or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in injury or equipment damage.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, can result in equipment damage.

PLEASE NOTE

The word "drive" as used in this manual refers to the "controller portion" of the adjustable speed drive as defined by NEC.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this documentation.

Before you begin

Read and understand these instructions before performing any procedure with this drive.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Many components of the product, including the printed circuit boards, operate with mains voltage. Do not touch. Use only electrically insulated tools.
- Do not touch unshielded components or terminals with voltage present.
- Motors can generate voltage when the shaft is rotated. Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.
- Before performing work on the drive system:
  - Disconnect all power, including external control power that may be present.
  - Place a "Do Not Turn On" label on all power switches.
  - Lock all power switches in the open position.
  - Wait 15 minutes to allow the DC bus capacitors to discharge. The DC bus LED is not an indicator of the absence of DC bus voltage that can exceed 800 Vdc.
  - Measure the voltage on the DC bus between the DC bus terminals using a properly rated voltmeter to verify that the voltage is < 42 Vdc.
  - If the DC bus capacitors do not discharge properly, contact your local Schneider Electric representative.
- Install and close all covers before applying voltage.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Read and understand this manual before installing or operating the Altivar 312 drive.
- Any changes made to the parameter settings must be performed by qualified personnel.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

DAMAGED EQUIPMENT

Do not install or operate any drive that appears damaged.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage, and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[a]
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

a. For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.”

Documentation structure

The following Altivar 312 technical documents are available on the Schneider Electric website (www.schneider-electric.com).

Installation Manual

This manual describes how to install and connect the drive.

Programming manual

This manual describes the functions and parameters of the drive's terminals and how to use them.

Quick Start

This document describes how to connect and configure the drive so that the motor can be started both quickly and easily for basic applications. This document is supplied with the drive.

Manuals for Modbus®, CANopen®, etc.

These manuals describe the installation process, the bus or network connections, signaling, diagnostics and the configuration of parameters specific to communication.
They also describe the communication services of the protocols.

Software enhancements

Since it was first marketed, the Altivar ATV 312 has been equipped with additional functions. Software version V5.1 IE 50 has now been updatedto V5.1 IE 54. This documentation relates to version V5.1 IE 54.
The software version appears on the rating plate attached to the side of the drive.

Enhancements made to version V5.1 IE 54 in comparison to V5.1 IE 50

New possible configuration

- Local configuration : By pressing the MODE button during 3 seconds, the drive switches automatically to Local configuration. The embedded Jog Dial works as a potentiometer (Fr1 = AIV1) and embedded RUN button is activated.

- Remote configuration : This is the factory configuration.

INSTALLATION

1. Please refer to the Installation Manual.

PROGRAMMING

2. Apply input power to the drive, but do not give a run command.

3. Configure:

- ☐ The nominal frequency of the motor [Standard mot. freq] (bFr) page 41 if this is not 50 Hz,
- ☐ The motor parameters in the [MOTOR CONTROL] (drC-) menu, page 41, only if the factory configuration of the drive is not suitable,
- ☐ The application functions in the [INPUTS / OUTPUTS CFG] (I-O-) menu, page 47, the [COMMAND] (CtL-) menu, page 50, and the [APPLICATION FUNCT.] (FUn-) menu, page 62, only if the factory configuration of the drive is not suitable.

4. In the [SETTINGS] (SEt-) menu, adjust the following parameters:

- ☐ [Acceleration] (ACC), page 32 and [Deceleration], (dEC) page 32,
- ☐ [Low speed] (LSP), page 33 and [High speed] (HSP), page 33,
- ☐ [Mot. therm. current] (ItH), page 33.

5. Start the drive.

Tips:

- Before beginning programming, complete the customer setting tables, page 112.
- Use the [Restore config.] (FCS) parameter, page 46, to return to the factory settings at any time.
- To locate the description of a function quickly, use the index of functions on page 111.
- Before configuring a function, read carefully the "Function compatibility" section on pages 21 and 22.
- **Note:**
  The following operations must be performed for optimum drive performance in terms of accuracy and response time:
  - Enter the values indicated on the (motor) rating plate in the [MOTOR CONTROL] (drC-) menu, page 41.
  - Perform auto-tuning with the motor cold and connected using the [Auto-tuning] (tun) parameter, page 43.
  - Adjust the [FreqLoopGain] (FLG) parameter, page 33 and the [Fr.Loop.Stab] (StA) parameter, page 34.

Before powering up the drive

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Make sure that all logic inputs are inactive to avoid any unintended operation.

Failure to follow these instructions will result in death or serious injury.

Before configuring the drive

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Read and understand this manual before installing or operating the ATV312 drive.
- Any changes made to the parameter settings must be performed by qualified personnel.
- Make sure that all logic inputs are inactive to avoid any unintended operation when parameters are being changed.

Failure to follow these instructions will result in death or serious injury.

Start-up

Note: When factory settings apply and during power-up/manual reset or after a stop command, the motor can only be powered once the "forward", "reverse" and "DC injection stop" commands have been reset. If they have not been reset, the drive will display [Freewheel stop] (nSt) but will not start. If the automatic restart function has been configured ([Automatic restart] (Atr) parameter in the [FAULT MANAGEMENT] (FLt-) menu, page 91), these commands are taken into account without a reset (to zero) being necessary.

Line contactor

CAUTION

RISK OF DAMAGE TO DRIVE

- Frequent use of the contactor will cause premature ageing of the filter capacitors.
- Do not have cycle times less than 60 seconds.

Failure to follow these instructions can result in equipment damage.

Using a motor with a lower rating or dispensing with a motor altogether

- With the factory settings, motor output phase loss detection is active ([Output Phase Loss] (OPL) = [YES] (YES), page 94). To avoid having to use a motor with the same rating as the drive when testing the drive or during a maintenance phase, deactivate motor output phase loss detection ([Output Phase Loss] (OPL) = [No] (nO)). This can prove particularly useful if very powerful drives are being used.
- Set the [U/F mot 1 selected] (UFt) parameter, page 44, on [Cst. torque] (L) in the [MOTOR CONTROL] (drC-) menu.

CAUTION

RISK OF DAMAGE TO MOTOR

Motor thermal protection will not be provided by the drive if the motor 's nominal current is 20% lower than that of the drive. Find an alternative source of thermal protection.

Failure to follow these instructions can result in equipment damage.

Factory configuration

Factory settings

The Altivar 312 is factory-set for the most common operating conditions:

- Display: drive ready [Ready] (rdY) with motor stopped, and motor frequency with motor running.
- The LI5 and LI6 and logic inputs, AI3 analog input, AOC analog output, and R2 relay are unaffected.
- Stop mode when fault detected: freewheel

Code	Description	Value	Page
bFr	[Standard mot. freq]	[50Hz IEC]	41
tCC	[2/3 wire control]	[2 wire] (2C): 2-wire control	30
uFt	[U/F mot 1 selected]	[SVC] (n): Sensorless flux vector control for constant torque applications	44
ACC dEC	[Acceleration] [Deceleration]	3.00 seconds	63
LSP	[Low speed]	0 Hz	33
HSP	[High speed]	50 Hz	33
ItH	[Mot. therm. current]	Nominal motor current (value depending on drive rating)	33
SdC1	[Auto DC inj. level 1]	0.7 x nominal drive current, for 0.5 seconds	35
SFr	[Switching freq.]	4 kHz	40
rrS	[Reverse assign.]	[LI2] (LI2): Logic input LI2	48
PS2	[2 preset speeds]	[LI3] (LI3): Logic input LI3	72
PS4	[4 preset speeds]	[LI4] (LI4): Logic input LI4	72
Fr1	[Ref.1 channel]	[AI1] (AI1) - Analog input AI1	29
SA2	[Summing ref. 2]	[AI2] (AI2) - Analog input AI2	70
r1	[R1 Assignment]	[No drive flt] (FLt): The contact opens when a fault is detected or when the drive has been switched off	49
brA	[Dec ramp adapt.]	[Yes] (YES): Function active (automatic adaptation of deceleration ramp)	64
Atr	[Automatic restart]	[No] (nO): Function inactive	91
Stt	[Type of stop]	[Ramp stop] (rMP): On ramp	65
CFG	[Macro configuration]	[Factory set.] (Std) (1)	45

Check whether the values above are compatible with the application. If necessary, the drive can be used without changing the settings.

(1) If you want to keep the drive's presettings to a minimum, select the macro configuration [Macro configuration] (CFG) = [Start/stop] (StS) followed by [Restore config.] (FCS) = [Factory Set.] (InI) (page 46).

The [Start/stop] (StS) macro configuration is the same as the factory configuration, apart from the I/O assignment:

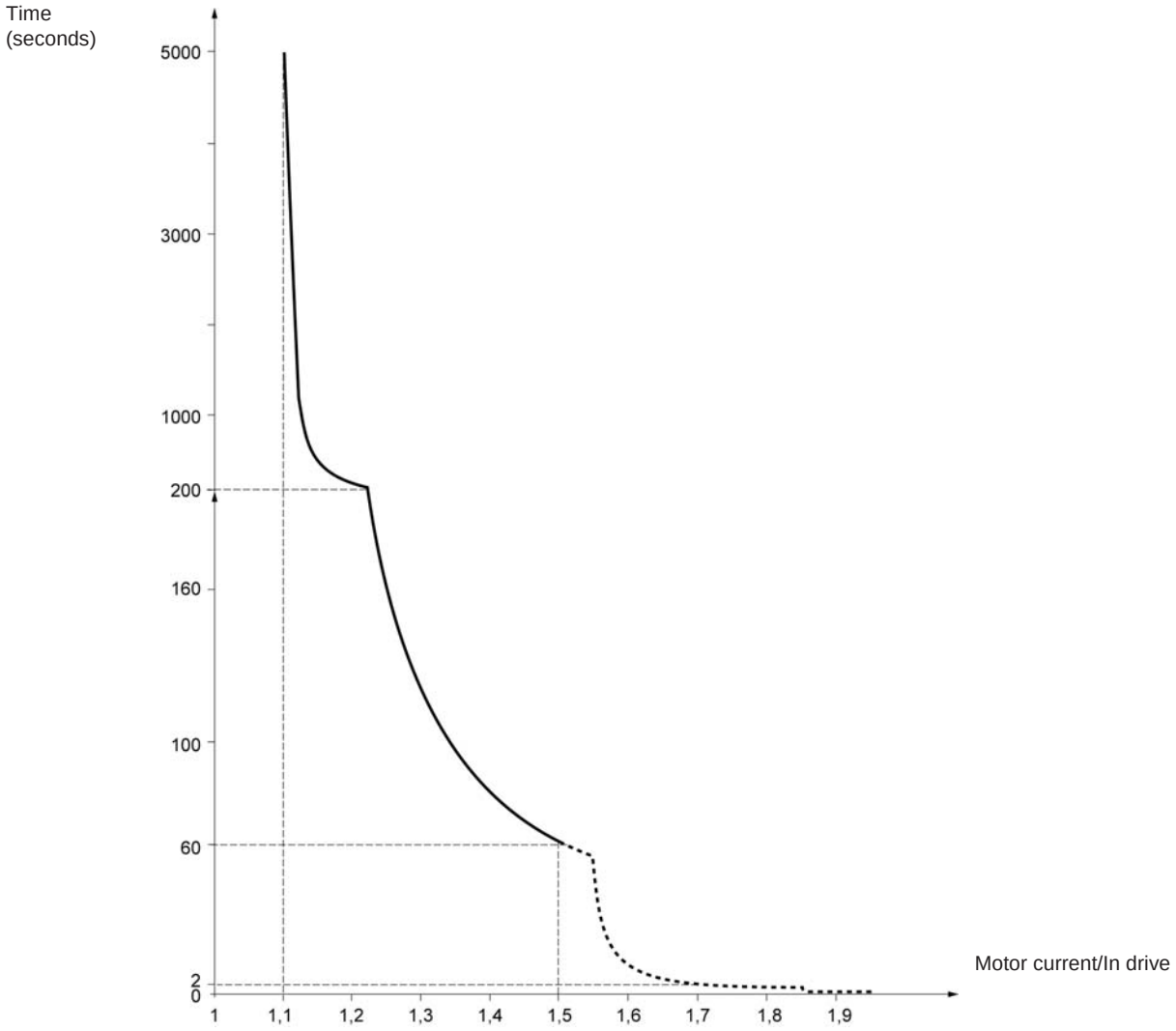
- Logic inputs:
  - LI1, LI2 (reversing): 2-wire transition detection control, LI1 = run forward, LI2 = run reverse.
  - LI3 to LI6: Inactive (not assigned).
- Analog inputs:
  - AI1: Speed reference 0-10 V.
  - AI2, AI3: Inactive (not assigned).
- Relay R1: The contact opens in the event of a detected fault (or drive off).
- Relay R2: Inactive (not assigned).
- Analog output AOC: 0-20 mA, inactive (not assigned).

Drive thermal protection

Functions:

Thermal protection by PTC probe fitted on the heatsink or integrated in the power module.
Indirect protection of the drive against overloads by tripping in the event of an overcurrent. Typical tripping values:

- Motor current = 185% of nominal drive current: 2 seconds
- Motor current = 150% of nominal drive current: 60 seconds



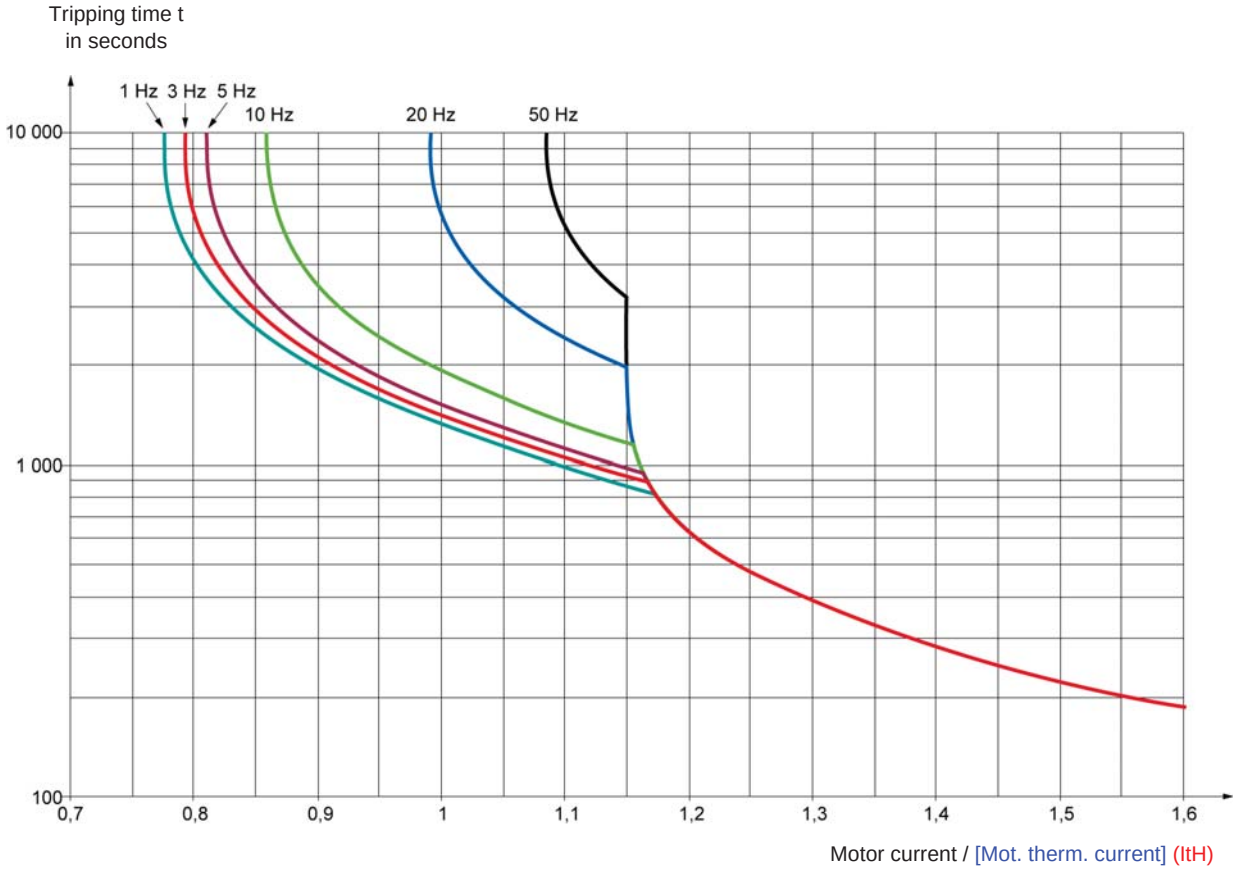
Drive ventilation

The fan starts up when the drive is powered up then shuts down after 10 seconds if a run command has not been received.
The fan is powered automatically when the drive is unlocked (direction of operation + reference). It is powered down a few seconds after the drive is locked (motor speed < 0.2 Hz and injection braking completed).

Motor thermal protection

Function:

Thermal protection by calculating the I^2t.
The protection takes account of self-cooled motors.



CAUTION
RISK OF DAMAGE TO MOTOR External protection against overloads is required under the following circumstances: • When the product is being switched on again, as there is no memory to record the motor thermal state • When supplying more than one motor • When supplying motors with ratings less than 0.2 times the nominal drive current • When using motor switching **Failure to follow these instructions can result in equipment damage.**

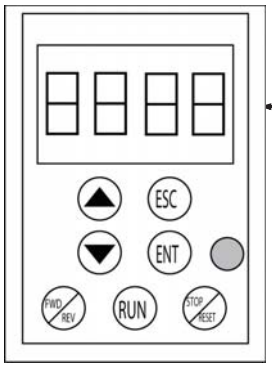
Remote display terminal option, ATV31

This terminal is a local control unit which can be mounted on the door of the wall-mounted or floor-standing enclosure. It has a cable with connectors, which is connected to the drive serial link (see the manual supplied with the terminal). Its display capabilities are practically identical to those of the Altivar 312. With this terminal, however, up and down arrows are used for navigation rather than a jog dial. There is also an access locking switch for the menus. There are three buttons for controlling the drive (1):

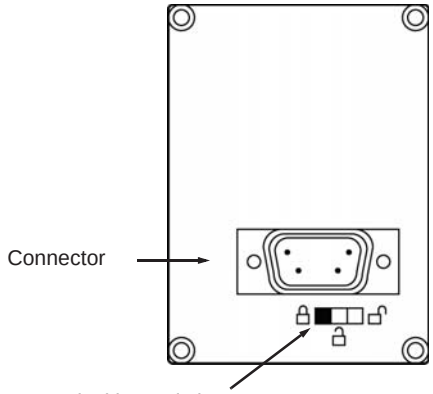
- FWD/REV: Reversal of the direction of rotation
- RUN: Motor run command
- STOP/RESET: Motor stop command or reset

Pressing the button a first time stops the motor, and if DC injection standstill braking is configured, pressing it a second time stops this braking.

View of the front panel::



View of the rear panel :



- Position: [MONITORING] (SUP-) and [SPEED REFERENCE] (rEF-) menus can be accessed.
- Position: [SETTINGS] (SEt-), [MONITORING] (SUP-) and [SPEED REFERENCE] (rEF-) can be accessed.
- Position: All menus can be accessed

Note: Protection via customer confidential code has priority over the switch.

Note:

- The remote terminal access locking switch also locks access by the drive keys.
- When the remote display terminal is disconnected, any locking remains active for the drive keys.
- The remote display terminal will only be active if the [Modbus baud rate] (tbr) parameter in the [COMMUNICATION] (COM-) menu, page 98, still has its factory setting: [19.2 Kbps] (19.2).

(1) To activate the buttons on the remote display terminal, you first have to configure [HMI command] (LCC) = [Yes] (YES), page 61.

Saving and loading configurations

Up to four complete configurations for ATV312 drives without an option card can be stored on the remote display terminal. These configurations can be saved, transported and transferred from one drive to another of the same rating. 4 different operations for the same device can also be stored on the terminal.
See the [Saving config.] (SCS) and [Restore config.] (FCS) parameters in the [MOTOR CONTROL] (drC-) menu, pages 45 and 46, the [INPUTS / OUTPUTS CFG] (I-O-) menu, pages 49 and 49, the [COMMAND] (CtL-) menu, pages 61 and 61, and the [APPLICATION FUNCT.] (FUn-) menu, pages 90 and 90.

To transfer a configuration between an ATV31 and an ATV32, follow the procedure on page 90.

Description of the terminal

Thanks to the screen size of this graphic display terminal, which works with FLASH V1.1IE19 or higher and is part of the ATV71, it is possible to display more detailed information than can be shown on an on-board display. It is connected in the same way as the ATV31 remote display terminal.

1 Graphic display

2 Function keys:
F1: CODE
F2, F3: not used
F4: MODE

3 Button to stop/reset

4 Run button

5 Navigation button:

- Press (ENT): - To save the current value
  - To enter the selected menu or parameter
- Turn CW/CCW: - To increase or decrease a value
  - To go to the next or previous line
  - To increase or decrease the reference if control via the display terminal is activated

6 Button for reversing the direction of rotation of the motor

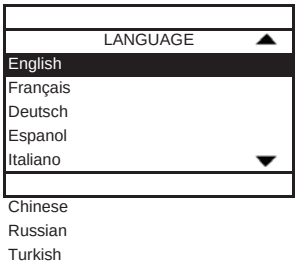
7 ESC button:cancels a value, a parameter or a menu to return to the previous selection

Note: Keys **3**, **4**, **5** and **6** can be used to control the drive directly, if control via the terminal is activated.

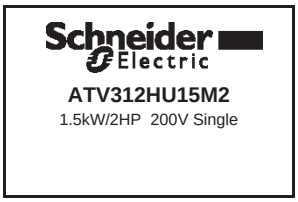
To activate the buttons on the remote display terminal, you first have to configure [HMI command] (LCC) = [Yes] (YES), page 61.

Powering up the graphic display terminal for the first time

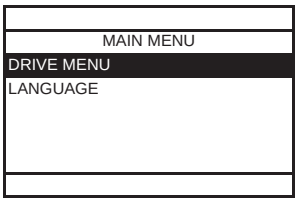
When powering up the graphic display terminal for the first time, the user has to select the required language.



Display after the graphic display terminal has been powered up for the first time.
Select the language and press ENT.

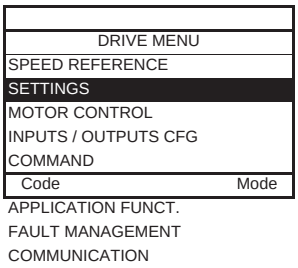


The drive's rating details will now appear.



The [MAIN MENU] follows automatically.

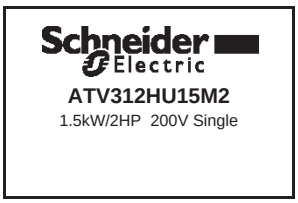
3 seconds or ENT



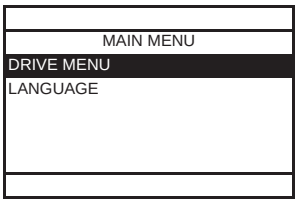
Automatically switches to the [DRIVE MENU] menu after 3 seconds.
Select the menu and press ENT.

Powering up the drive for the first time

When powering up the drive for the first time, the user immediately accesses the 3 parameters below: [Standard mot. freq] (bFr), [Ref.1 channel] (Fr1), and [2/3 wire control] (tCC), page 30. .

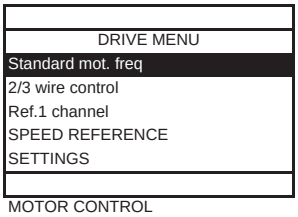


Display after the drive has been powered up for the first time.



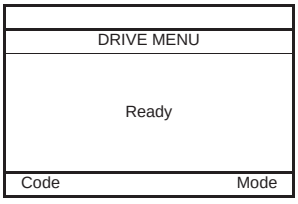
The [MAIN MENU] follows automatically.

3 seconds



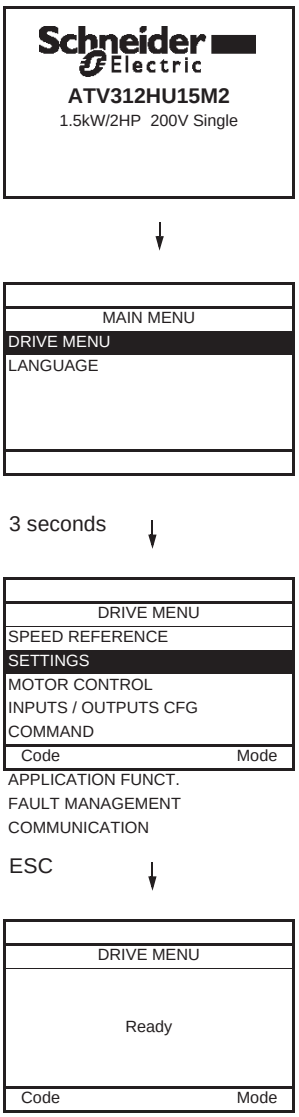
Automatically switches to the [DRIVE MENU] menu after 3 seconds.
Select the menu and press ENT.

ESC



The word "Ready" appears on the graphic display terminal if you press the ESC key when in the [DRIVE MENU].

Subsequent power-ups



Display after powering up.

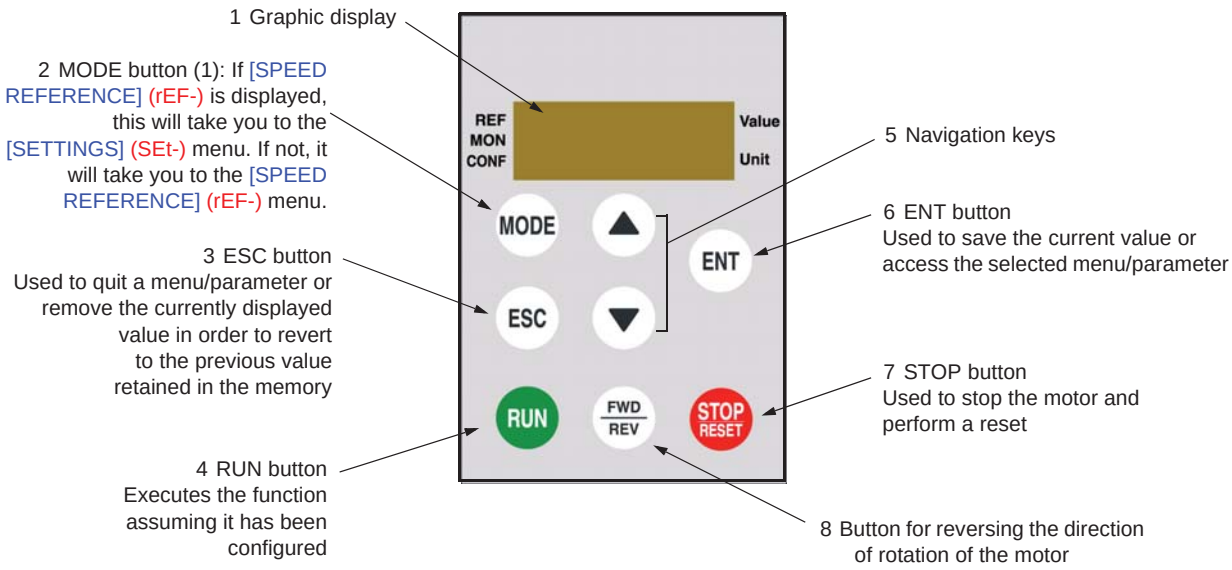
The [MAIN MENU] follows automatically.

Automatically switches to the [DRIVE MENU] menu after 3 seconds.
Select the menu and press ENT.

The word "Ready" appears on the graphic display terminal if you press the ESC key when in the [DRIVE MENU].

Description of the terminal

This terminal is a local control unit which can be mounted on the door of the wall-mounted or floor-standing enclosure. It has a cable with connectors, which is connected to the drive serial link (see the manual supplied with the terminal). Its display capabilities are practically identical to those of the Altivar 312. With this terminal, up and down arrows are used for navigation rather than a jog dial.



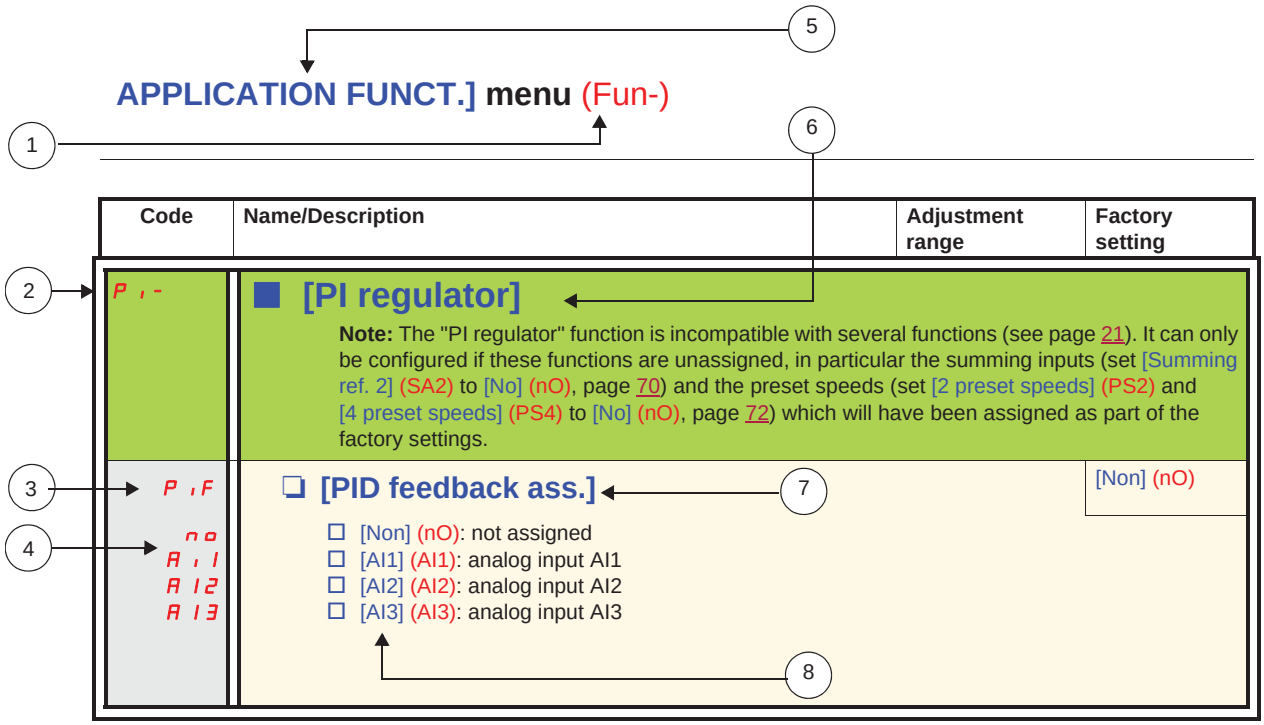
(1) If the drive is locked by a code ([PIN code 1] (COd), page 103), pressing the Mode key enables you to switch from the [MONITORING] (SUP-) menu to the [SPEED REFERENCE] (rEF-) menu and vice versa.

To activate the buttons on the remote display terminal, you first have to configure [HMI command] (LCC) = [Yes] (YES), page 61.

Structure of the parameter tables

The parameter tables contained in the descriptions of the various menus are organized as follows.

Example :



1. Name of menu on 4-digit 7-segment display
2. Submenu code on 4-digit 7-segment display
3. Parameter code on 4-digit 7-segment display
4. Parameter value on 4-digit 7-segment display
5. Name of menu on ATV61/ATV71 graphic display terminal
6. Name of submenu on ATV61/ATV71 graphic display terminal
7. Name of parameter on ATV61/ATV71 graphic display terminal
8. Value of parameter on ATV61/ATV71 graphic display terminal

Compatibility of functions

Incompatible functions

The following functions will be inaccessible or deactivated in the cases described below:

Automatic restart

This is only possible for the 2-wire level control type ([2/3 wire control] (tCC) = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO)).

Catch on the fly

This is only possible for the 2-wire level control type ([2/3 wire control] (tCC) = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO)).
This function is locked if automatic standstill injection has been configured as DC ([Auto DC injection] (AdC) = [Continuous] (Ct)).

Function compatibility table

The choice of application functions may be limited by the number of I/O and by the fact that some functions are incompatible with one another. Functions which are not listed in this table are compatible.
If there is an incompatibility between functions, the first function configured will prevent the others being configured.

To configure a function, first check that functions which are incompatible with it are unassigned, especially those which are assigned in the factory settings.

	Summing inputs (factory setting)	+/- speed (1)	Management of limit switches	Preset speeds (factory setting)	PI regulator	Jog operation	Brake control	DC injection stop	Fast stop	Freewheel stop
Summing inputs (factory setting)		●		↑	●	↑				
+/- speed (1)	●			●	●	●				
Management of limit switches					●					
Preset speeds (factory setting)	←	●			●	↑				
PI regulator	●	●	●	●		●	●			
Jog operation	←	●		←	●		●			
Brake control					●	●		●		
DC injection stop							●			↑
Fast stop										↑
Freewheel stop								←	←	

(1) Excluding special application with reference channel [Ref.2 channel] (Fr2) (see diagrams 53 and 55)

● Incompatible functions Compatible functions Not applicable

Priority functions (functions which cannot be active at the same time):

← ↑ The function marked with the arrow takes priority over the other.

Stop functions take priority over run commands.
Speed references via logic command take priority over analog references.

Compatibility of functions

Logic and analog input application functions

Each of the functions on the following pages can be assigned to one of the inputs.
A single input can activate several functions at the same time (reverse and 2nd ramp for example). **The user must therefore ensure that these functions can be used at the same time**.
The [MONITORING] (SUP-) menu ([[LOGIC INPUT CONF.]] (LIA-) parameter, page 104, and [[ANALOG INPUTS IMAGE]] (AIA-) parameter, page 104) can be used to display the functions assigned to each input in order to check their compatibility.

Before assigning a reference, command or function to a logic or analog input, the user must check that this input has not already been assigned in the factory settings and that no other input has been assigned to an incompatible or unwanted function.

- Example of incompatible function to be unassigned:
  In order to use the "+speed/-speed" function, the preset speeds and summing input 2 must first be unassigned.

The table below lists the factory-set input assignments and the procedure for unassigning them.

Assigned input	Function	Code	To unassign, set to:	Page
LI2	Run reverse	rrS	nO	48
LI3	2 preset speeds	PS2	nO	72
LI4	4 preset speeds	PS4	nO	72
AI1	Reference 1	Fr1	Anything but AI1	58
LI1	Run forward	tCC	2C or 3C	47
AI2	Summing input 2	SA2	nO	70

List of functions that can be assigned to inputs/outputs

Logic inputs	Page	Code	Factory setting
Not assigned	-	-	LI5 - LI6
Run forward	-	-	LI1
2 preset speeds	72	PS2	LI3
4 preset speeds	72	PS4	LI4
8 preset speeds	72	PS8	
16 preset speeds	73	PS16	
2 preset PI references	80	Pr2	
4 preset PI references	81	Pr4	
+ speed	77	USP	
- speed	77	dSP	
Jog operation	75	JoG	
Ramp switching	64	rPS	
2nd current limit switching	86	LC2	
Fast stop via logic input	65	FSt	
DC injection via logic input	66	dCI	
Freewheel stop via logic input	67	nSt	
Run reverse	48	rrS	LI2
External fault	93	EtF	
RESET	92	rSF	
Forced local mode	99	FLo	
Reference switching	59	rFC	
Control channel switching	60	CCS	
Motor switching	87	CHP	
Forward limit switch	89	LAF	
Reverse limit switch	89	LAr	
Fault inhibition	96	InH	

Analog inputs	Page	Code	Factory setting
Not assigned	-	-	AI3
Reference 1	58	Fr1	AI1
Reference 2	58	Fr2	
Summing input 2	70	SA2	AI2
Summing input 3	70	SA3	
PI regulator feedback	80	PIF	

List of functions that can be assigned to inputs/outputs

Analog/logic output	Page	Code	Factory setting
Not assigned	-	-	AOC/AOV
Motor current	48	oCr	
Motor frequency	48	oFr	
Motor torque	48	otr	
Power supplied by the drive	48	oPr	
Drive detected fault (logic data)	48	FLt	
Drive running (logic data)	48	run	
Frequency threshold reached (logic data)	48	FtA	
High speed (HSP) reached (logic data)	48	FLA	
Current threshold reached (logic data)	48	CtA	
Frequency reference reached (logic data)	48	SrA	
Motor thermal threshold reached (logic data)	48	tSA	
Brake sequence (logic data)	48	bLC	

Relay	Page	Code	Factory setting
Not assigned	-	-	R2
Detected fault	49	FLt	R1
Drive running	49	run	
Frequency threshold reached	49	FtA	
High speed (HSP) reached	49	FLA	
Current threshold reached	49	CtA	
Frequency reference reached	49	SrA	
Motor thermal threshold reached	49	tSA	
Brake sequence	49	bLC	
Copy of the logic input	49	LI1 to LI6	

List of functions that can be assigned to the Network and Modbus control word bits

Bits 11 to 15 of the control word	Page	Code
2 preset speeds	72	PS2
4 preset speeds	72	PS4
8 preset speeds	72	PS8
16 preset speeds	73	PS16
2 preset PI references	80	Pr2
4 preset PI references	81	Pr4
Ramp switching	64	rPS
2nd current limit switching	86	LC2
Fast stop via logic input	65	FSt
DC injection	66	dC1
External fault	93	EtF
Reference switching	59	rFC
Control channel switching	60	CCS
Motor switching	87	CHP

Checklist

Carefully read the information contained in the programming, installation and simplified manuals, as well as the information in the catalog. Before starting to use the drive, please check the following points relating to mechanical and electrical installations.
For the full range of documentation, please visit www.schneider-electric.com.

1. Mechanical installation (see the simplified and installation manuals)

- For details of the different installation types and recommendations concerning ambient temperature, please refer to the installation instructions in the simplified or installation manuals.
- Install the drive vertically in accordance with the specifications. Please refer to the installation instructions in the simplified or installation manuals.
- When using the drive, both the environmental conditions defined under standard 60721-3-3 and the levels defined in the catalog must be respected.
- Install the required options for your application. Refer to the catalog for details.

2. Electrical installation (see the simplified and installation manuals)

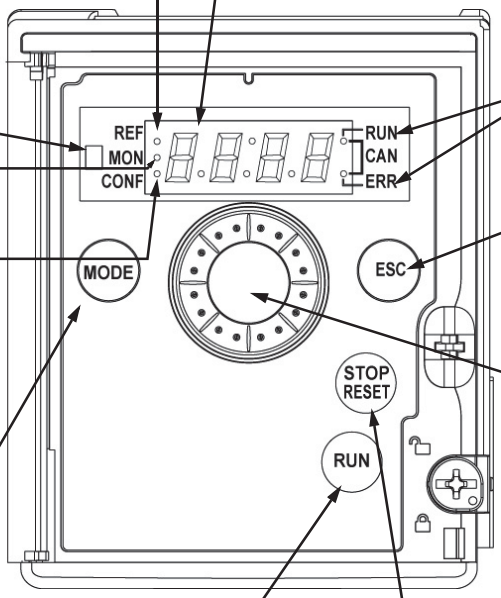
- Ground the drive. See the sections on how to ground equipment in the simplified and installation manuals.
- Make sure the input supply voltage matches the nominal drive voltage and connect the line supply in accordance with the simplified and installation manuals.
- Make sure you use appropriate input line fuses and circuit breakers. See the simplified and installation manuals.
- Arrange the cables for the control terminals as required (see the simplified and installation manuals). Separate the supply and control cables in accordance with EMC compatibility rules.
- The ATV312●●●●M2 and ATV312●●●●N4 ranges include an EMC filter Using an IT jumper helps reduce leakage current. This is explained in the paragraph about the internal EMC filter on the ATV312●●●●M2 and the ATV312●●●●N4 in the installation manual.
- Make sure the motor connections are right for the voltage (star, delta).

3. Using and starting up the drive

- Start the drive. [Standard mot. freq] (bFr), page 29, is displayed the first time the drive is powered up. Make sure the frequency defined by frequency bFr (the factory setting is 50 Hz) matches the motor's frequency.
- When the drive is powered up for the first time, the [Ref.1 channel] (Fr1) parameter, page 29, and the [2/3 wire control] (tCC) parameter, page 30, are displayed after [Standard mot. freq] (bFr). These parameters will need to be adjusted if you wish to control the drive locally.
- When the drive is powered up subsequently, [Ready] (rdY) is displayed on the HMI.
- The [Restore config.] (FCS) function, page 46, is used to reinitialize the drive with the factory settings.

Description of the HMI

Functions of the display and the keys



- REF LED, illuminated if [SPEED REFERENCE] (rEF-) menu is active
- Load LED
- MON LED, illuminated if [MONITORING] (SUP-) menu is active
- CONF LED, illuminated if the [SETTINGS] (SEt-), [MOTOR CONTROL] (drC-),[INPUTS / OUTPUTS CFG] (I-O-), [COMMAND] (CtL-), [APPLICATION FUNCT] (FUn-), [FAULT MANAGEMENT] (FLt-) or [COMMUNICATION] (COM-) menus are active
- 4 x 7 segment display
- 2 CANopen status LEDs
- Used to quit a menu or parameter or to clear the value displayed in order to revert to the value in the memory
- In LOCAL configuration, 2s press on ESC button switches between the control/ programming modes
- Jog dial - can be used for navigation by turning it clockwise or counter-clockwise - pressing the jog dial enables the user to make a selection or confirm information. = ENT

Functions as a potentiometer in LOCAL configuration and in REMOTE configuration if [Ref.1 channel] (Fr1-) in the [COMMAND] (CtL-) menu is set to [Image input AIV1] (AIV1)

MODE button (1): 3s press on MODE button switches between the REMOTE/LOCAL configurations. If [SPEED REFERENCE] (rEF-) is displayed, this will take you to the [SETTINGS] (SEt-) menu. If not, it will take you to the [SPEED REFERENCE] (rEF-) menu.

RUN button: Controls powering up of the motor for forward running in LOCAL configuration and in REMOTE configuration if the [2/3 wire control] (tCC) parameter in the [INPUTS /OUTPUTS CFG] (I-O-) menu is set to [Local] (LOC), page 47 (could be hidden by door if function disabled)

STOP/RESET button
- Enables detected fault to be reset
- Can be used to control motor stopping
  - If [2/3 wire control] (tCC) is not set to [Local] (LOC), freewheel stop
  - If [2/3 wire control] (tCC) is set to [Local] (LOC), stop on ramp or freewheel stop during DC injection braking

Note1: In LOCAL configuration, the three Leds REF, MON,and CONF are blinking simultaneously in programming mode and are working as a Led chaser in control mode.

Normal display, with no fault code displayed and no startup:

- 43.0 : Displays the parameter selected in the [MONITORING] (SUP-) menu (default: motor frequency). If the current is limited, the display flashes. In such cases, CLI will appear at the top left if an ATV61/ATV71 graphic display terminal is connected to the drive.
- InIt : Initialization sequence
- rdY : Drive ready
- dCb : DC injection braking in progress
- nSt : Freewheel stop
- FSt : Fast stop
- tUn : Auto-tuning in progress

In the event of a detected fault, the display will flash to notify the user accordingly. If an ATV61/ATV71 graphic display terminal is connected, the name of the detected fault will be displayed.

(1) If the drive is locked by a code ([PIN code 1] (COd), page 103), pressing the Mode key enables you to switch from the [MONITORING] (SUP-) menu to the [SPEED REFERENCE] (rEF-) menu and vice versa. It is no longer possible to switch between LOCAL and REMOTE configurations.

Easy REMOTE and LOCAL configuration

The LOCAL configuration allows to activate automatically the embedded RUN button and the jog dial as a potentiometer.
In that configuration, the speed adjustment will also be effective on remote keypads. MODE button on ATV12 remote display terminal and on ATV61/71 graphic display terminal (function key F4) is also active to switch from one configuration to another.

[Ref.1 channel] (Fr1) is set to [AI Virtual 1] (AIV1) and [2/3 wire control] (tCC) are set to [Local] (LOC) when switching to LOCAL configuration.
Choose the configuration (REMOTE or LOCAL) before starting the parameters adjustment of the drive.
For parameters interdependencies reasons, switching from one configuration to another will change other parameters (for example : Input/ Output assignment will return to their factory value).

⚠ DANGER

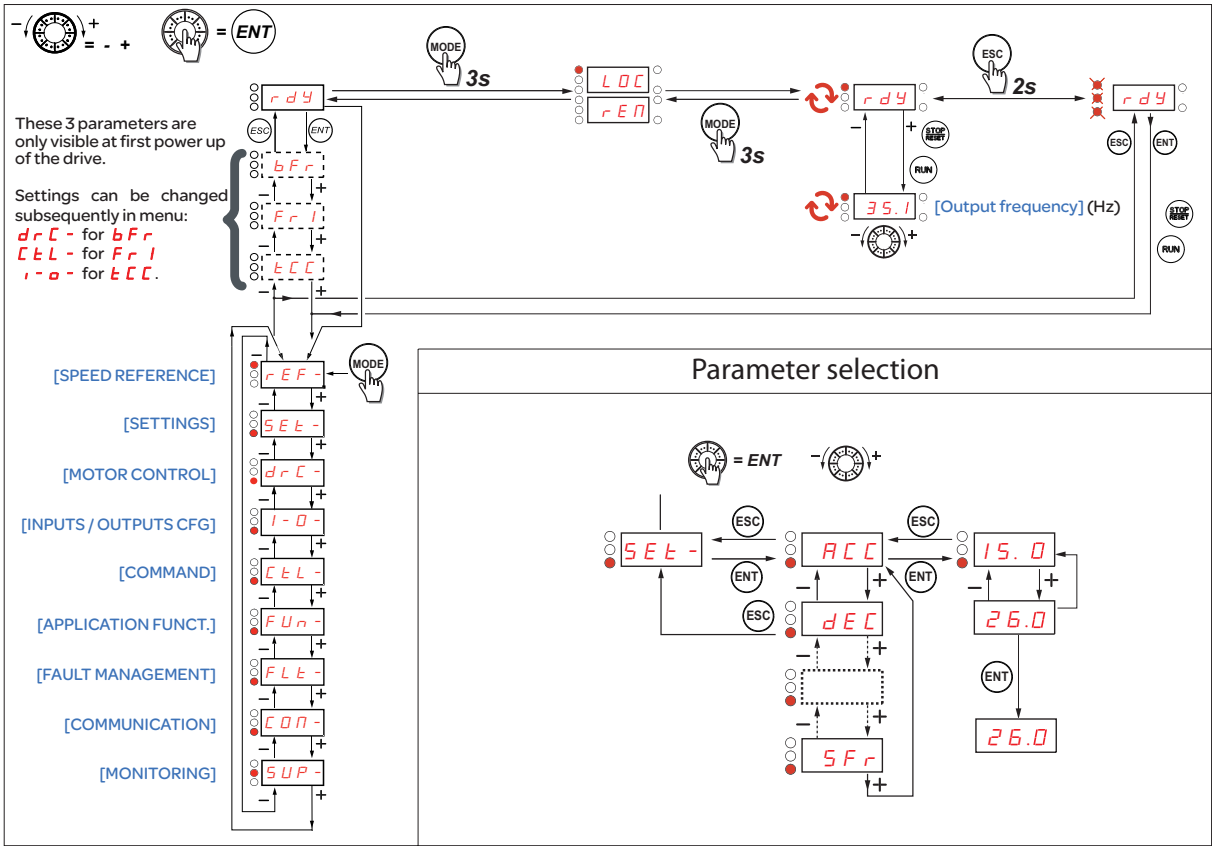
UNINTENDED EQUIPMENT OPERATION

When switching from REMOTE to LOCAL configuration, all the assignments involving the logic inputs will revert to their default values.

- Check that this change is compatible with the wiring diagram used.

Failure to follow these instructions will result in death or serious injury.

Structure of the menus



Configuring the [Standard mot. freq] (bFr), [2/3 wire control] (tCC), and [Ref.1 channel] (Fr1) parameters

These parameters can only be modified when the drive is stopped and no run command is present.

Code	Description	Adjustment range	Factory setting
bFr	❏ **[Standard mot. freq]** This parameter is only visible the first time the drive is powered up. It can be modified at any time in the [MOTOR CONTROL] (drC-) menu. 50 [50Hz IEC] (50): 50 Hz 60 [60Hz NEMA] (60): 60 Hz This parameter modifies the presets of the following parameters: [High speed] (HSP), page 33, [Freq. threshold] (Ftd), page 39, [Rated motor freq.] (FrS), page 41, and [Max frequency] (tFr), page 44		[50Hz IEC] (50)
Fr1	❏ **[Ref.1 channel]** ☐ AI1 [AI1] (AI1) - Analog input AI1 ☐ AI2 [AI2] (AI2) - Analog input AI2 ☐ AI3 [AI3] (AI3) - Analog input AI3 ☐ AIU1 [AI Virtual 1] (AIV1) - In terminal control mode, the jog dial functions as a potentiometer. If [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), the following additional assignments are possible: ☐ UPDT [+/- SPEED] (UPdt): +/- speed reference via LI. See configuration page 77. ☐ UPDH [+/-spd HMI] (UPdH): +/- speed reference by turning the jog dial on the ATV312 keypad. To use, display the frequency [Output frequency] (rFr), page 101. The +/- speed function via the keypad or the terminal is controlled from the [MONITORING] (SUP-) menu by selecting the [Output frequency] (rFr) parameter. If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following additional assignments are possible: ☐ LCC [HMI] (LCC) reference via the remote display terminal, [HMI Frequency ref.] (LFr) parameter in the [SETTINGS] (SEt-) menu, page 32 ☐ Mdb [Modbus] (Mdb): Reference via Modbus ☐ nEt [Com. card] (nEt): Reference via network communication protocol		[AI1] (AI1)

Code	Description	Adjustment range	Factory setting
tCC	❏ **[2/3 wire control]**		[2 wire] (2C)

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

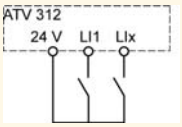
When the [2/3 wire control] (tCC) parameter is changed, the [Reverse assign.] (rrS) parameter, page 48, and the [2 wire type] (tCt) parameter, page 47, and all the assignments involving the logic inputs will revert to their default values.
Check that this change is compatible with the wiring diagram used.

Failure to follow these instructions will result in death or serious injury.

Control configuration:

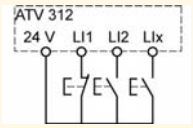
- 2C ☐ [2 wire] (2C): 2-wire control
- 3C ☐ [3 wire] (3C): 3-wire control
- LOC ☐ [Local] (LOC): Local control (RUN/STOP/RESET drive) (invisible if [ACCESS LEVEL] (LAC) = [Level 3] (L3), page 58)

2-wire control: The open or closed state of the input controls running or stopping.
Wiring example:
LI1: Forward
LIx: Reverse



2 s

3-wire control (pulse control): A "forward" or "reverse" pulse is sufficient to control startup, a "stop" pulse is sufficient to control stopping.
Wiring example:
LI1: Stop
LI2: Forward
LIx: Reverse



2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

[SPEED REFERENCE] (rEF-) menu

The [SPEED REFERENCE] (rEF-) menu displays [HMI Frequency ref.] (LFr), [Image input AIV1] (AIV1) or [Frequency ref.] (FrH) depending on which control channel is active.

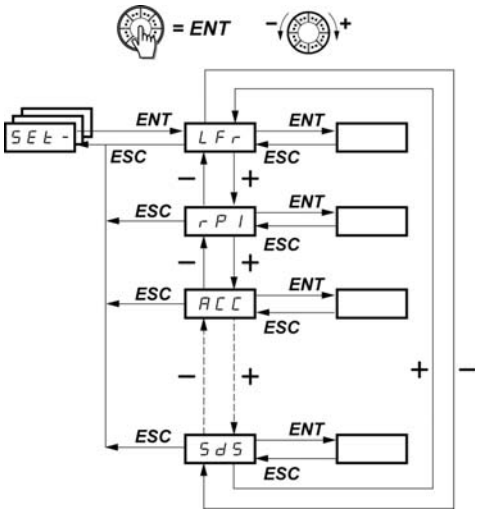
During local control, the HMI's jog dial functions as a potentiometer, making it possible to increase or reduce the reference value within limits defined by the [Low speed] (LSP) and [High speed] (HSP) parameters.

When local control is deactivated, by the [Ref.1 channel] (Fr1) parameter, only the reference values are displayed. The value will be read-only and can only be changed via the jog dial (the speed reference is supplied by an AI or another source).

The reference displayed will depend on how the drive has been configured.

Code	Description	Factory setting
LFr	❑ **[HMI Frequency ref.]** This parameter only appears if the function has been enabled. It is used to change the speed reference from the remote control. ENT does not have to be pressed to enable a change of reference.	0 to 500 Hz
AIU1	❑ **[Image input AIV1]** Used to amend the speed reference via the jog dial	0 to 100%
FrH	❑ **[Frequency ref.]** This parameter is read-only. It enables you to display the speed reference applied to the motor, regardless of which reference channel has been selected.	LSP to HSP Hz

[SETTINGS] (SEt-) menu



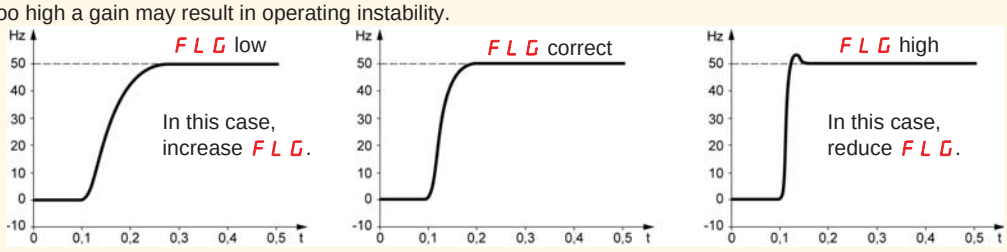
Speed reference via the display terminal

Scaling factor for the [Cust. output value] (SPd1) parameter

The adjustment parameters can be modified with the drive running or stopped.
Note: Changes should preferably be made with the drive stopped.

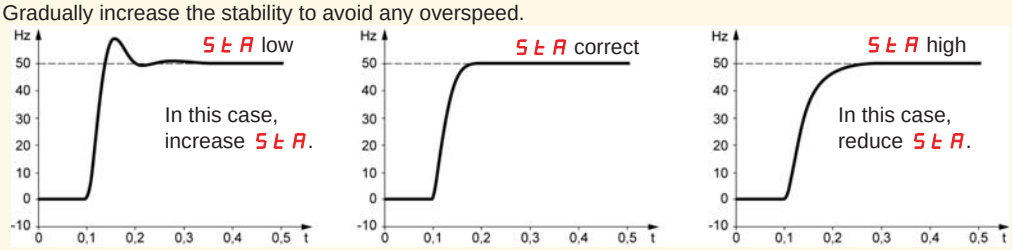
Code	Description	Adjustment range	Factory setting
LFr ★	❑ **[HMI Frequency ref.]**	0 to HSP	-
	This parameter is displayed if [HMI command] (LCC) = [Yes] (YES), page 61 or if [Ref.1 channel] (Fr1)/[Ref.2 channel] (Fr2) = [HMI] (LCC) page 58, and if a remote display terminal is connected. In such cases, [HMI Frequency ref.] (LFr) can also be accessed via the drive's keypad. [HMI Frequency ref.] (LFr) is reinitialized to 0 when power is switched off.		
rPI ★	❑ **[Internal PID ref.]**	0.0 to 100%	0%
	Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80.		
ACC	❑ **[Acceleration]**	In accordance with inr, page 63	3 s
	Defined to accelerate from 0 to the nominal frequency [Rated motor freq.] (FrS) in the [MOTOR CONTROL] (drC-) menu.		
AC2 ★	❑ **[Acceleration 2]**	In accordance with inr, page 63	5 s
	Parameter can be accessed if [Ramp 2 threshold] (Frt) > 0, page 64, or if [Ramp switch ass.] (rPS) is assigned, page 64.		
dE2 ★	❑ **[Deceleration 2]**	In accordance with inr, page 63	5 s
	Parameter can be accessed if [Ramp 2 threshold] (Frt) > 0, page 64, or if [Ramp switch ass.] (rPS) is assigned, page 64.		
dEC	❑ **[Deceleration]**	In accordance with inr, page 63	3 s
	Defined to decelerate from the nominal frequency [Rated motor freq.] (FrS) (parameter in the [MOTOR CONTROL] (drC-)) menu to 0. Check that the value for [Deceleration] (dEC) is not too low in relation to the load to be stopped.		

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Adjustment range	Factory setting
tA1 ★	❑ **[Begin Acc round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to 100	10
tA2 ★	❑ **[End Acc round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to (100-tA1)	10
tA3 ★	❑ **[Begin Dec round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to 100	10
tA4 ★	❑ **[End Dec round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to (100-tA3)	10
LSP	❑ **[Low speed]** Motor frequency at min. reference	0 to HSP	0
HSP	❑ **[High speed]** Motor frequency at max. reference: Ensure that this setting is appropriate for the motor and the application.	LSP to tFr	bFr
ItH	❑ **[Mot. therm. current]** Set [Mot. therm. current] (ItH) to the nominal current indicated on the motor's rating plate. If you wish to suppress thermal protection, see [Overload fault mgt] (OLL), page 94.	0.2 to 1.5 In (1)	In accordance with the drive rating
UFr	❑ **[IR compensation]** - For [U/F mot 1 selected] (UFt) = [SVC] (n) or [Energy sav.] (nLd), page 44: IR compensation - For [U/F mot 1 selected] (UFt) = [Cst. torque] (L) or [Var. torque] (P), page 44: Voltage boost Used to optimize the torque at very low speed (increase [IR compensation] (UFr) if the torque is insufficient). Check that the value for [IR compensation] (UFr) is not too high when the motor is in a hot state otherwise some instabilities can occur. **Note:** Changing [U/F mot 1 selected] (UFt), page 44, will cause [IR compensation] (UFr) to return to its factory setting (20%).	0 to 100%	20%
FLG ★	❑ **[FreqLoopGain]** Parameter can only be accessed if [U/F mot 1 selected] (UFt) = [SVC] (n) or [Energy sav.] (nLd), page 44. The FLG parameter adjusts the drive's ability to follow the speed ramp on the basis of the inertia of the machine being driven. Too high a gain may result in operating instability. 	1 to 100%	20%

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Adjustment range	Factory setting
StA	❑ [Fr.Loop.Stab]	1 to 100%	20%
	Parameter can only be accessed if [U/F mot 1 selected] (UFt) = [SVC] (n) or [Energy sav.] (nLd), page 44. Used to adapt the return to steady state after a speed transient (acceleration or deceleration), according to the dynamics of the machine. Gradually increase the stability to avoid any overspeed. 		
SLP	❑ [Slip compensation]	0 to 150%	100%
	Parameter can only be accessed if [U/F mot 1 selected] (UFt) = [SVC] (n) or [Energy sav.] (nLd), page 44. Adjusts the slip compensation around the value set by the nominal motor speed. The speeds given on motor rating plates are not necessarily exact. • If slip setting < actual slip: the motor is not rotating at the correct speed in steady state. • If slip setting > actual slip: the motor is overcompensated and the speed is unstable.		
idC	❑ [DC inject. level 1] (2)	0 to In (1)	0.7 In (1)
	CAUTION **RISK OF DAMAGE TO THE MOTOR** • Check that the motor will withstand this current without overheating.. **Failure to follow these instructions can result in equipment damage.** Parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI), page 65, or if [DC injection assign.] (dCI) is not set to [No] (nO), page 66. After 5 seconds, the injection current is limited to 0.5 [Mot. therm. current] (ItH) if set to a higher value.		
tdC	❑ [DC injection time 2] (2)	0.1 to 30 s	0.5 s
	CAUTION **RISK OF DAMAGE TO THE MOTOR** • Long periods of DC injection braking can cause overheating and damage the motor. • Protect the motor by avoiding long periods of DC injection braking. **Failure to follow these instructions can result in equipment damage.** Parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI) , page 65.		
tdC1	❑ [Auto DC inj. time 1]	0.1 to 30 s	0.5 s
	CAUTION **RISK OF DAMAGE TO THE MOTOR** • Long periods of DC injection braking can cause overheating and damage the motor. • Protect the motor by avoiding long periods of DC injection braking. **Failure to follow these instructions can result in equipment damage.** Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68.		

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.
(2) **Note:** These settings are not related to the "automatic standstill DC injection" function.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Adjustment range	Factory setting
SdC1	❑ [Auto DC inj. level 1]	0 to 1.2 In (1)	0.7 In (1)
	CAUTION **RISK OF DAMAGE TO THE MOTOR** • Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**		
★	Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68. **Note:** Check that the motor will withstand this current without overheating.		
tdC2	❑ [Auto DC inj. time 2]	0 to 30 s	0 s
	CAUTION **RISK OF DAMAGE TO THE MOTOR** • Long periods of DC injection braking can cause overheating and damage the motor. • Protect the motor by avoiding long periods of DC injection braking. **Failure to follow these instructions can result in equipment damage.**		
★	Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68.		
SdC2	❑ [Auto DC inj. level 2]	0 to 1.2 In (1)	0.5 In (1)
	CAUTION **RISK OF DAMAGE TO THE MOTOR** • Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**		
★	Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68. **Note:** Check that the motor will withstand this current without overheating.		

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.
(2) **Note:** These settings are not related to the "automatic standstill DC injection" function.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Adjustment range	Factory setting
JPF	❑ **[Skip Frequency]** Helps to prevent prolonged operation at a frequency range of ± 1 Hz around [Skip Frequency] (JPF). This function helps to prevent a critical speed which leads to resonance. Setting the function to 0 renders it inactive.	0 to 500 Hz	0 Hz
JF2	❑ **[Skip Frequency 2]** Helps to prevent prolonged operation at a frequency range of ± 1 Hz around [Skip Frequency 2] (JF2). This function helps to prevent a critical speed which leads to resonance. Setting the function to 0 renders it inactive.	1 to 500 Hz	0 Hz
JGF ★	❑ **[Jog frequency]** Parameter can be accessed if [JOG] (JOG) is not set to [No] (nO), page 75.	0 to 10 Hz	10 Hz
rPG ★	❑ **[PID prop. gain]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. It provides dynamic performance when PI feedback is changing quickly.	0.01 to 100	1
rIG ★	❑ **[PID integral gain]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. It provides static precision when PI feedback is changing slowly.	0.01 to 100/s	1
FbS ★	❑ **[PID fbk scale factor]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. For adapting the process.	0.1 to 100	1
PIC nO YES ★	❑ **[PID correct. reverse]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. ☐ [No] (nO): Normal ☐ [Yes] (YES): Reverse		[No] (nO)
rP2 ★	❑ **[Preset ref. PID 2]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80, and if [2 preset PID ref.] (Pr2), page 80, has been enabled by the input selection.	0 to 100%	30%
rP3 ★	❑ **[Preset ref. PID 3]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80, and if [4 preset PID ref.] (Pr4), page 81, has been enabled by the input selection.	0 to 100%	60%
rP4 ★	❑ **[Preset ref. PID 4]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80, and if [4 preset PID ref.] (Pr4), page 81, has been enabled by the input selection.	0 to 100%	90%
SP2 ★	❑ **[Preset speed 2]** See page 73.	0 to 500 Hz	10 Hz

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[SETTINGS] (SEt-) menu

Code	Description	Adjustment range	Factory setting
SP3 ★	❑ [Preset speed 3] See page 73.	0 to 500 Hz	15 Hz
SP4 ★	❑ [Preset speed 4] See page 73.	0 to 500 Hz	20 Hz
SP5 ★	❑ [Preset speed 5] See page 73.	0 to 500 Hz	25 Hz
SP6 ★	❑ [Preset speed 6] See page 73.	0 to 500 Hz	30 Hz
SP7 ★	❑ [Preset speed 7] See page 73.	0 to 500 Hz	35 Hz
SP8 ★	❑ [Preset speed 8] See page 73.	0 to 500 Hz	40 Hz
SP9 ★	❑ [Preset speed 9] See page 73.	0 to 500 Hz	45 Hz
SP10 ★	❑ [Preset speed 10] See page 73.	0 to 500 Hz	50 Hz
SP11 ★	❑ [Preset speed 11] See page 74.	0 to 500 Hz	55 Hz
SP12 ★	❑ [Preset speed 12] See page 74.	0 to 500 Hz	60 Hz
SP13 ★	❑ [Preset speed 13] See page 74.	0 to 500 Hz	70 Hz
SP14 ★	❑ [Preset speed 14] See page 74.	0 to 500 Hz	80 Hz
SP15 ★	❑ [Preset speed 15] See page 74.	0 to 500 Hz	90 Hz
SP16 ★	❑ [Preset speed 16] See page 74.	0 to 500 Hz	100 Hz

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Adjustment range	Factory setting
CL1	❑ [Current Limitation]	0.25 to 1.5 In (1)	1.5 In (1)

CAUTION

RISK OF DAMAGE TO THE MOTOR AND THE DRIVE

- Check that the motor will withstand this current, particularly in the case of permanent magnet synchronous motors, which are susceptible to demagnetization.
- Check that the profile mission complies with the derating curve given in the installation manual.

Failure to follow these instructions can result in equipment damage.

Used to limit the torque and the temperature rise of the motor.

CL2	❑ [I Limit. 2 value]	0.25 to 1.5 In (1)	1.5 In (1)

CAUTION

RISK OF DAMAGE TO THE MOTOR AND THE DRIVE

- Check that the motor will withstand this current, particularly in the case of permanent magnet synchronous motors, which are susceptible to demagnetization.
- Check that the profile mission complies with the derating curve given in the installation manual.

Failure to follow these instructions can result in equipment damage.

★ Parameter is only visible if [Current limit 2] (LC2) is not set to [No] (nO), page 86.

tLS	❑ [Low speed time out]	0 to 999.9 s	0 (no time limit)

After operating at [Low speed] (LSP) for a given time, the motor is stopped automatically. The motor restarts if the frequency reference is greater than the [Low speed] (LSP) and if a run command is still present.
Note: Value 0 corresponds to an unlimited period.

rSL	❑ [PID wake up thresh.]	0 to 100%	0%

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

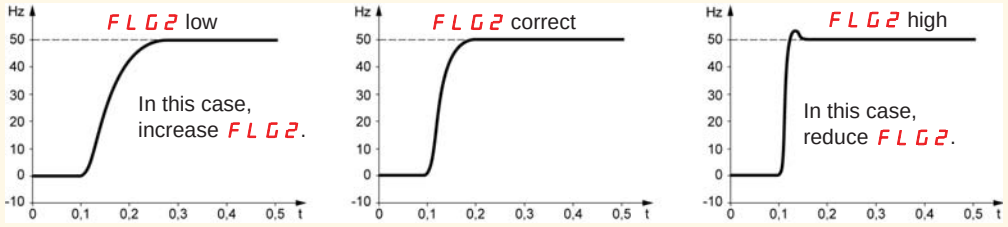
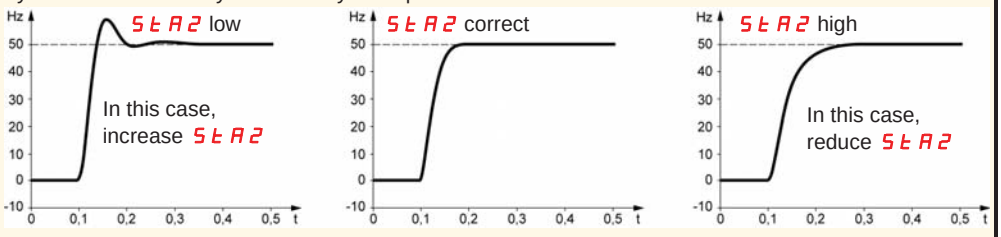
- Check that unintended restarts will not present any danger.

Failure to follow these instructions will result in death or serious injury

★ Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80.
If the "PI" and "Low speed operating time" [Low speed time out] (tLS) functions, page 38, are configured at the same time, the PI regulator may attempt to set a speed lower than [Low speed] (LSP).
This results in unsatisfactory operation, which consists of starting, operating at [Low speed] (LSP), then stopping, and so on.
The [PID wake up thresh.] (rSL) parameter (restart error threshold) is used to set a minimum PID error threshold for restarting after a stop at prolonged [Low speed] (LSP).
The function is inactive if [Low speed time out] (tLS) = 0.

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Adjustment range	Factory setting
uFr2 ★	❑ **[IR compensation 2]**	0 to 100%	20%
	For [U/F mot.2 selected] (UFt2) = [SVC] (n) or [Energy sav.] (nLd): IR compensation. For [U/F mot.2 selected] (UFt2) = [Cst. torque] (L) or [Var. torque] (P): voltage boost. Used to optimize the torque at very low speed (increase [IR compensation 2] (UFr2) if the torque is insufficient). Check that the value for [IR compensation 2] (UFr2) is not too high when the motor is in a hot state otherwise some instabilities can occur. Changing [U/F mot.2 selected] (UFt2) will cause [IR compensation 2] (UFr2) to return to its factory setting (20%).		
FLG2 ★	❑ **[FreqLoopGain 2]**	0 to 100%	20%
	Parameter can only be accessed if [U/F mot.2 selected] (UFT2) = [SVC] (n) or [Energy sav.] (nLd), page 88. The [FreqLoopGain 2] (FLG2) parameter adjusts the drive's ability to follow the speed ramp on the basis of the inertia of the machine being driven. Too high a gain may result in operating instability.		
			
StA2 ★	❑ **[Freq. loop stability 2]**	0 to 100%	20%
	Parameter can only be accessed if [U/F mot.2 selected] (UFT2) = [SVC] (n) or [Energy sav.] (nLd), page 88. Used to adapt the return to steady state after a speed transient (acceleration or deceleration), according to the dynamics of the machine. Gradually increase the stability to avoid any overspeed.		
			
SLP2 ★	❑ **[Slip compensation 2]**	0 to 150%	100%
	Parameter can only be accessed if [U/F mot.2 selected] (UFT2) = [SVC] (n) or [Energy sav.] (nLd), page 88. Adjusts the slip compensation around the value set by the nominal motor speed. The speeds given on motor rating plates are not necessarily exact. • If slip setting < actual slip: The motor is not rotating at the correct speed in steady state. • If slip setting > actual slip: The motor is overcompensated and the speed is unstable.		
Ftd	❑ **[Freq. threshold]**	0 to 500 Hz	bFr
	Threshold beyond which the contact on the relay ([R1 Assignment] (r1) or [R2 Assignment] (r2) = [Freq.Th.att.] (FtA)) closes or output AOV = 10 V ([Analog./logic output] (dO) = [Freq. limit] (FtA)).		
ttd	❑ **[Motor therm. level]**	1 to 118%	100%
	Threshold beyond which the contact on the relay ([R1 Assignment] (r1) or [R2 Assignment] (r2) = [Th.mot. att.] (tSA)) closes or output AOV = 10 V ([Analog./logic output] (dO) = [Drv thermal] (tSA)).		
Ctd	❑ **[Current threshold]**	0 to 1.5 In (1)	In (1)
	Threshold beyond which the contact on the relay ([R1 Assignment] (r1) or [R2 Assignment] (r2) = [I attained] (CtA)) closes or output AOV = 10 V ([Analog./logic output] (dO) = [Current limit] (CtA)).		

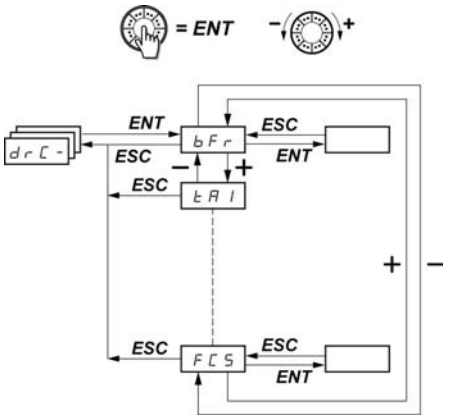
(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Adjustment range	Factory setting
SdS	❑ **[Scale factor display]** Used to display a value in proportion to the output frequency [Output frequency] (rFr): the machine speed, the motor speed, etc. • If [Scale factor display] (SdS) ⩽ 1, [Cust. output value] (SPd1) is displayed (possible definition = 0.01) • If 1 < [Scale factor display] (SdS) ⩽ 10, [Cust. output value] (SPd2) is displayed (possible definition = 0.1) • If [Scale factor display] (SdS) > 10, [Cust. output value] (SPd3) is displayed (possible definition = 1) • If [Scale factor display] (SdS) > 10 and [Scale factor display] (SdS) x [Output frequency] (rFr) > 9,999: the display will show [Cust. output value] (SPd3) = $\frac{\text{[Scale factor display] (SdS) x [Output frequency] (rFr)}}{1000}$ to 2 decimal places example: for 24,223, display will show 24.22 - If [Scale factor display] (SdS) > 10 and [Scale factor display] (SdS) x [Output frequency] (rFr) > 65,535, display locked at 65.54 Example: Display motor speed for 4-pole motor, 1,500 rpm at 50 Hz (synchronous speed): [Scale factor display] (SdS) = 30 [Cust. output value] (SPd3) = 1,500 at [Output frequency] (rFr) = 50 Hz	0.1 to 200	30
SFr	❑ **[Switching freq.]** (1) Parameter can also be accessed in the [MOTOR CONTROL] (drC-) menu. The frequency can be adjusted to reduce the noise generated by the motor. If the frequency has been set to a value higher than 4 kHz, in the event of excessive temperature rise, the drive will automatically reduce the switching frequency and increase it again once the temperature has returned to normal.	2.0 to 16 kHz	4 kHz

(1) Parameter can also be accessed in the [MOTOR CONTROL] (drC-) menu.

[MOTOR CONTROL] (drC-) menu



Standard motor frequency

Return to factory settings/Restore configuration

With the exception of [Auto tuning] (tUn), which can power up the motor, parameters can only be changed in stop mode, with no run command present.

On the optional ATV31 remote display terminal, this menu can be accessed with the switch in the position.

Drive performance can be optimized by:
- Entering the values given on the motor rating plate in the Drive menu
- Performing an auto-tune operation (on a standard asynchronous motor)

Code	Description	Adjustment range	Factory setting
bFr 50 60	❏ **[Standard mot. freq]** [50Hz IEC] (50): 50 Hz: IEC [60Hz NEMA] (60): 60 Hz: NEMA This parameter modifies the presets of the following parameters: [High speed] (HSP), page 33, [Freq. threshold] (Ftd), page 39, [Rated motor freq.] (FrS), page 41, and [Max frequency] (tFr), page 44.		[50Hz IEC] (50)
UnS	❏ **[Rated motor volt.]** Nominal motor voltage given on the rating plate. When the line voltage is lower than the nominal motor voltage, set [Rated motor volt.] (UnS) to the same value as the line voltage for the drive terminals. ATV312●●●M2: 100 to 240 V ATV312●●●M3: 100 to 240 V ATV312●●●N4: 100 to 500 V ATV312●●●S6: 100 to 600 V	In accordance with the drive rating	In accordance with the drive rating
FrS	❏ **[Rated motor freq.]** Nominal motor frequency marked on the rating plate. The factory setting is 50 Hz, or 60 Hz if [Standard mot. freq] (bFr) is set to 60 Hz. **Note:** The ratio $\frac{\text{[Rated motor volt.] (UnS) (in volts)}}{\text{[Rated motor freq.] (FrS) (in Hz)}}$ must not exceed the following values: ATV312●●●M2: 7 max. ATV312●●●M3: 7 max. ATV312●●●N4: 14 max. ATV312●●●S6: 17 max. The factory setting is 50 Hz, or preset to 60 Hz if [Standard mot. freq] (bFr) is set to 60 Hz.	10 to 500 Hz	50 Hz
nCr	❏ **[Rated mot. current]** Nominal motor current given on the rating plate.	0.25 to 1.5 In (1)	In accordance with the drive rating

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

rEF-
SEt-
drC-
i-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Description	Adjustment range	Factory setting
nSP	❑ [Rated motor speed]	0 to 32,760 rpm	In accordance with the drive rating
	0 to 9,999 rpm then 10.00 to 32.76 krpm If, rather than the nominal speed, the nameplate indicates the synchronous speed and the slip in Hz or as a %, calculate the nominal speed as follows: • Nominal speed = synchronous speed x $\frac{100 - \text{slip as a \%}}{100}$ or • Nominal speed = synchronous speed x $\frac{50 - \text{slip in Hz}}{50}$ (50 Hz motors) or • Nominal speed = synchronous speed x $\frac{60 - \text{slip in Hz}}{60}$ (60 Hz motors)		
CoS	❑ [Motor 1 Cosinus Phi]	0.5 to 1	In accordance with the drive rating
	Motor Cos Phi given on the motor rating plate		
rSC nO InIt 8888	❑ [Cold stator resist.]		[No] (nO)
	☐ [No] (nO): function inactive. For applications which do not require high performance or do not tolerate automatic auto-tuning (passing a current through the motor) each time the drive is powered up. ☐ [Init] (InIt): activates the function. To improve low-speed performance whatever the thermal state of the motor. ☐ Value of cold state stator resistance used, in mΩ. **Note:** • **It is strongly recommended that this function is activated for mechanical handling applications.** • The function should only be activated [Init] (InIt) when the motor is cold. • When [Cold stator resist.] (rSC) = [Init] (InIt), the [Auto-tuning] (tUn) parameter is forced to [Power on] (POn). At the next run command the stator resistance is measured with an auto-tune. The [Cold stator resist.] (rSC) then changes to a value of (8888) and maintains it, [Auto-tuning] (tUn) is still forced to [Power on] (POn). The [Cold stator resist.] (rSC) parameter remains at [Init] (InIt) as long as the measurement has not been performed. • Value 8888 can be forced or changed using the jog dial (1).		

(1) Procedure:
- Check that the motor is cold.
- Disconnect the cables from the motor terminals.
- Measure the resistance between 2 of the motor terminals (U. V. W.) without modifying its connection.
- Use the jog dial to enter half the measured value.
- Increase the factory setting of [IR compensation] (UFr), page 33, to 100% rather than 20%.

Note: Do not use [Cold stator resist.] (rSC) if it is not set to [No] (nO) or = [Power on] (POn) with catch on the fly ([CATCH ON THE FLY] (FLr-), page 93).

Code	Description	Adjustment range	Factory setting
tun	❑ [Auto tuning]		[No] (nO)

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- During auto-tuning the motor operates at nominal current.
- Do not work on the motor during auto-tuning.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

LOSS OF CONTROL

- It is essential that the **[Rated motor volt.] (UnS)**, **[Rated motor freq.] (FrS)**, **[Rated motor freq.] (nCr)**, **[Rated motor speed] (nSP)** , **[Motor 1 Cosinus Phi.] (COS)** parameters are configured correctly before starting auto-tuning.
- When one or more parameters have been changed after auto-tuning has been performed, **[Auto-tuning] (tUn)** will return **[No] (nO)** and the procedure will have to be repeated.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

no / YES
- ☐ [No] (nO): Auto-tuning not performed
- ☐ [Yes] (YES): Auto-tuning is performed as soon as possible, then the parameter automatically changes to [Done] (dOnE) or [No] (nO) in the event that Auto-tuning is not successful [AUTO TUNING FAULT] (tnF) is displayed if [Autotune fault mgt] (tnL) = [Yes] (YES), page 95).

donE / run / Pon / LI1 to LI6
- ☐ [Done] (dOnE): Use of the values given the last time auto-tuning was performed
- ☐ [Drv running] (rUn): Auto-tuning is performed every time a run command is sent.
- ☐ [Power on] (POn): Auto-tuning is performed on every power-up.
- ☐ [LI1] to [LI16] (LI1) to (LI6): Auto-tuning is performed on the transition from 0 → 1 of a logic input assigned to this function.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK OR ARC FLASH

When **[Auto tuning] (tUn)** is set **[Power on] (POn)**, Auto tune will be performed every time the power will be switched on.

- Check this action will not endanger personnel or equipment in any way.

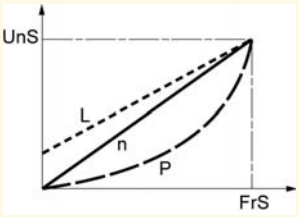
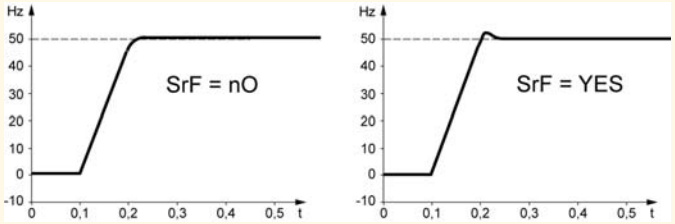
Failure to follow these instructions will result in death or serious injury.

Note:
[Auto-tuning] (tUn) is forced to [Power on] (POn) if [Cold stator resist.] (rSC) = [Init] (InIt).
Auto-tuning is only performed if no command has been activated. If a "freewheel stop" or "fast stop" function is assigned to a logic input, this input must be set to 1 (active at 0).
Auto-tuning may take 1 to 2 seconds. Do not interrupt the process. Wait for the display to change to [Done] (dOnE) or [No] (nO).

tUS	❑ [Auto tuning state]		[Not done] (tAb)

(For information only, cannot be modified)

tAb / PEnd / ProG / FAIL / donE / Strd / CuS
- ☐ [Not done] (tAb): The default stator resistance value is used to control the motor.
- ☐ [Pending] (PEnd): Auto-tuning has been requested but not yet performed.
- ☐ [In Progress] (PrOG): Auto-tuning in progress.
- ☐ [Failed] (FAIL): Auto-tuning was unsuccessful.
- ☐ [Done] (dOnE): The stator resistance measured by the auto-tuning function is used to control the motor.
- ☐ [Entered R1] (Strd): The cold state stator resistance ([Cold stator resist.] (rSC) which is not set to [No] (nO)) is used to control the motor.
- ☐ [Customized] (CUS): The value of [Cold stator resist.] (rSC) is set manually.

Code	Description	Adjustment range	Factory setting
uFt	**❑ [U/F mot 1 selected]**		[SVC] (n)
L P n nLd	☐ [Cst. torque] (L): Constant torque for motors connected in parallel or special motors. ☐ [Var. torque] (P): Variable torque for pump and fan applications. ☐ [SVC] (n): Sensorless flux vector control for constant torque applications. ☐ [Energy sav.] (nLd): Energy saving, for variable torque applications not requiring high dynamics (behaves in a similar way to the [Var. torque] (P) ratio with no load and the [SVC] (n) ratio on load). Voltage  Frequency		
nrd	**❑ [Noise reduction]**		[Yes] (YES)
YES no	☐ [Yes] (YES): Frequency with random modulation. ☐ [No] (nO): Fixed frequency. Random frequency modulation helps to prevent any resonance which may occur at a fixed frequency.		
SFr	**❑ [Switching freq.]** (1)	2.0 to 16 kHz	4 kHz
	The frequency can be adjusted to reduce the noise generated by the motor. If the frequency has been set to a value higher than 4 kHz, in the event of excessive temperature rise, the drive will automatically reduce the switching frequency and increase it again once the temperature has returned to normal.		
tFr	**❑ [Max frequency]**	10 to 500 Hz	60 Hz
	The factory setting is 60 Hz, or preset to 72 Hz if [Standard mot. freq] (bFr) is set to 60 Hz.		
SrF	**❑ [Speed loop filter]**		[No] (nO):
no YES	☐ [No] (nO): The speed loop filter is active (helps to prevent the reference being exceeded). ☐ [Yes] (YES): The speed loop filter is suppressed (in position control applications, this reduces the response time and the reference may be exceeded).  		

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.

Code	Description	Adjustment range	Factory setting
SCS no Str1 2 s	❏ **[Saving config.]** ☐ [No] (nO): Function inactive ☐ [Config 1] (Str1): Saves the current configuration (but not the result of auto-tuning) to EEPROM. [Saving config.] (SCS) automatically switches to [No] (nO) as soon as the save has been performed. This function is used to keep another configuration in reserve, in addition to the current configuration. When drives leave the factory the current configuration and the backup configuration are both initialized with the factory configuration. • If the ATV31 remote display terminal option is connected to the drive, the following additional selection options will appear: [File 1] (FIL1), [File 2] (FIL2), [File 3] (FIL3), [File 4] (FIL4) (files available in the remote display terminal's EEPROM memory for saving the current configuration). They can be used to store between 1 and 4 different configurations which can also be stored on or even transferred to other drives of the same rating. [Saving config.] (SCS) automatically switches to [No] (nO) as soon as the save has been performed.	(1)	[No] (nO)
CFG 2 s StS Std	❏ **[Macro configuration]** **⚠ DANGER** **UNINTENDED EQUIPMENT OPERATION** Check that the selected macro configuration is compatible with the wiring diagram used. **Failure to follow these instructions will result in death or serious injury.** Choice of source configuration. ☐ [Start/Stop] (StS): Start/stop configuration Identical to the factory configuration apart from the I/O assignments: • Logic inputs: - LI1, LI2 (reversing): 2-wire transition detection control, LI1 = run forward, LI2 = run reverse - LI3 to LI6: Inactive (not assigned) • Analog inputs: - AI1: Speed reference 0-10 V - AI2, AI3: Inactive (not assigned) • Relay R1: The contact opens in the event of a detected fault (or drive off). • Relay R2: Inactive (not assigned) • Analog output AOC: 0-20 mA, inactive (not assigned) ☐ [Factory set.] (Std): Factory configuration (see page 11). **Note:** The assignment of [Macro configuration] (CFG) results directly in a return to the selected configuration.	(1)	[Factory set.] (Std)

(1) [Saving config.] (SCS), [Macro configuration] (CFG), and [Restore config.] (FCS) can be accessed from several configuration menus, but they apply to all menus and parameters.
(2) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

Code	Description	Adjustment range	Factory setting
FCS	❑ [Restore config.]	(1)	[No] (nO)

2 s

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Check that the changes made to the current configuration are compatible with the wiring diagram used.

Failure to follow these instructions will result in death or serious injury.

nO
rEC1
InI

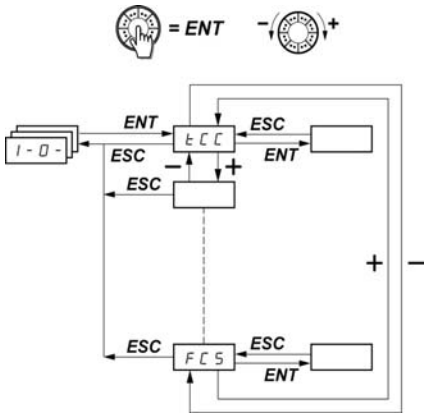
- ☐ [No] (nO): Function inactive.
- ☐ [Internal 1] (rEC1): The current configuration becomes identical to the backup configuration previously saved by [Saving config.] (SCS) = [Config 1] (Str1).
  [Internal 1] (rEC1) is only visible if the backup has been carried out. [Restore config.] (FCS) automatically switches to [No] (nO) as soon as this action has been performed.
- ☐ [Factory Set.] (InI): The current configuration is replaced by the configuration selected by the [Macro configuration] (CFG) parameter (2). [Restore config.] (FCS) automatically switches to [No] (nO) as soon as this action has been performed.
  If the ATV31 remote display terminal option is connected to the drive (3), the following additional selection options appear, as long as the corresponding files in the remote display terminal's EEPROM memory have been loaded (0 to 4 files): [File 1] (FIL1), [File 2] (FIL2), [File 3] (FIL3), [File 4] (FIL4). They enable the current configuration to be replaced with one of the 4 configurations that may be loaded on the remote display terminal.
  [Restore config.] (FCS) automatically switches to [No] (nO) as soon as this action has been performed.
  Note: If nAd appears on the display briefly before the parameter switches to [No] (nO), this means that the configuration transfer is not possible and has not been performed (different drive ratings, for example). If nEr appears on the display briefly before the parameter switches to [No] (nO), this means that an invalid configuration transfer has occurred and that the factory settings will need to be restored using [Factory Set.] (InI).
  In both cases, check the configuration to be transferred before trying again.

(1) [Saving config.] (SCS), [Macro configuration] (CFG), and [Restore config.] (FCS) can be accessed from several configuration menus, but they apply to all menus and parameters.

(2) The following parameters are not modified by this function; they retain their configuration:
- [Standard mot. freq] (bFr), page 41
- [HMI command] (LCC), page 61
- [PIN code 1] (COd), (terminal access code), page 103
- The parameters in the [COMMUNICATION] (COM-) menu
- The parameters in the [MONITORING] (SUP-) menu

(3) Options [File 1] (FIL1) to [File 4] (FIL4) continue to be displayed on the drive, even after the ATV31 remote terminal has been disconnected.

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.



2-wire/3-wire control

Return to factory settings/Restore configuration

The parameters can only be modified when the drive is stopped and no run command is present.
On the optional ATV31 remote display terminal, this menu can be accessed with the switch in the position.

Code	Description	Adjustment range	Factory setting
tCC 2 s	❏ **[2/3 wire control]** See page 30.		[2 wire] (2C)
tCt	❏ **[2 wire type]** **⚠ DANGER** **UNINTENDED EQUIPMENT OPERATION** Check that the changes made to 2-wire control are compatible with the wiring diagram used. **Failure to follow these instructions will result in death or serious injury.** Parameter can be accessed if [2/3 wire control] (tCC) = [2 wire] (2C), page 47. LEL ☐ [Level] (LEL): State 0 or 1 is taken into account for run or stop. trn ☐ [Transition] (trn): A change of state (transition or edge) is necessary to initiate operation, in order to help prevent accidental restarts after a break in the power supply. PFo ☐ [Fwd priority] (PFO): State 0 or 1 is taken into account for run or stop, but the "forward" input takes priority over the "reverse" input.		[Transition] (trn)

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

[INPUTS / OUTPUTS CFG] (I-O-) menu

rEF-
SEt-
drC-
I-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Description	Adjustment range	Factory setting
rrS	❑ **[Reverse assign.]**		[LI2] (LI2)

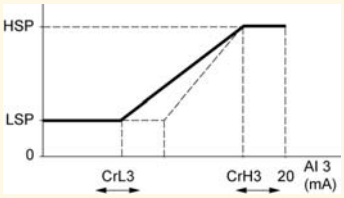
If [Reverse assign.] (rrS) = [No] (nO), run reverse remains active by means of negative voltage on AI2, for example.

- nO: ☐ [No] (nO): Not assigned
- LI1: ☐ [LI1] (LI1): Logic input LI1
- LI2: ☐ [LI2] (LI2): Logic input LI2 can be accessed if [2/3 wire control] (tCC) = [2 wire] (2C), page 47.
- LI3: ☐ [LI3] (LI3): Logic input LI3
- LI4: ☐ [LI4] (LI4): Logic input LI4
- LI5: ☐ [LI5] (LI5): Logic input LI5
- LI6: ☐ [LI6] (LI6): Logic input LI6

CrL3	❑ **[AI3 min. value]**	0 to 20 mA	4 mA
CrH3	❑ **[AI3 max. value]**	4 to 20 mA	20 mA

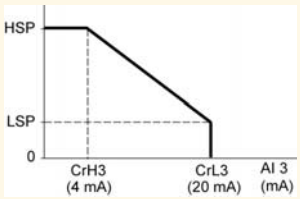
These two parameters are used to configure the input for 0-20 mA, 4-20 mA, 20-4 mA, etc.

Frequency



Example: 20 - 4 mA

Frequency



AoIt	❑ **[AO1 Type]**	[Current](0A)

This parameter is not visible when a communication card is connected to the product.

- 0A: ☐ [Current] (0A): 0 - 20 mA configuration (use terminal AOC)
- 4A: ☐ [Cur. 4-20] (4A): 4 - 20 mA configuration (use terminal AOC)
- 10u: ☐ [Voltage] (10U): 0 - 10 V configuration (use terminal AOV)

do	❑ **[Analog./logic output]**	[No] (nO)

This parameter is not visible when a communication card is connected to the product.

- nO: ☐ [No] (nO): Not assigned
- oCr: ☐ [I motor] (OCr): Motor current. 20 mA or 10 V corresponds to twice the nominal drive current.
- oFr: ☐ [Motor freq.] (OFr): Motor frequency. 20 mA or 10 V corresponds to the maximum frequency [Max frequency] (tFr), page 44.
- otr: ☐ [Motor torq.] (Otr): Motor torque. 20 mA or 10 V corresponds to twice the nominal motor torque.
- oPr: ☐ [P. supplied] (OPr): Power supplied by the drive. 20 mA or 10 V corresponds to twice the nominal drive power.

Making the following assignments (1) will transform the analog output to a logic output (see diagram in the Installation Manual):

- FLt: ☐ [Drive fault] (FLt): Fault detected
- run: ☐ [Drv running] (rUn): Drive running
- FtA: ☐ [Freq. limit] (FtA): Frequency threshold reached ([Freq. threshold] (Ftd) parameter in the [SETTINGS] (SEt-) menu, page 39)
- FLA: ☐ [HSP limit] (FLA): [High speed] (HSP) reached
- CtA: ☐ [I attained] (CtA): Current threshold reached ([Current threshold] (Ctd) parameter in the [SETTINGS] (SEt-) menu, page 39)
- SrA: ☐ [Freq. ref.] (SrA): Frequency reference reached
- tSA: ☐ [Drv thermal] (tSA): Motor thermal threshold reached ([Motor therm. level] (ttd) parameter in the [SETTINGS] (SEt-) menu, page 39)
- bLC: ☐ [Brake seq] (bLC): Brake sequence (for information, as this assignment can only be activated or deactivated from the [APPLICATION FUNCT.] (FUn-) menu, page 84)
- APL: ☐ [No 4-20mA] (APL): Loss of 4-20 mA signal, even if [4-20mA loss] (LFL) = [No] (nO), page 95

The logic output is in state 1 (24 V) when the selected assignment is active, with the exception of [Drive fault] (FLt) (state 1 if the drive operation is normal).

Note: (1) With these assignments, **configure** [AO1 Type] (AO1t) **=** [Current] (OA)**.**

[INPUTS / OUTPUTS CFG] (I-O-) menu

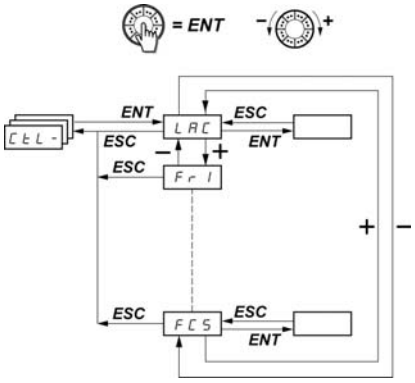
Code	Description	Adjustment range	Factory setting
r1	❏ **[R1 Assignment]** This parameter is not visible when a communication card is connected to the product. ☐ [No] (nO): Not assigned ☐ [No drive flt] (FLt): No drive detected fault ☐ [Drv running] (rUn): Drive running ☐ [Freq.Th.att.] (FtA): Frequency threshold reached ([Freq. threshold] (Ftd) parameter in the [SETTINGS] (SEt-) menu, page 39) ☐ [HSP attain.] (FLA): [High speed] (HSP) reached ☐ [I attained] (CtA): Current threshold reached ([Current threshold] (Ctd) parameter in the [SETTINGS] (SEt-) menu, page 39) ☐ [Freq.ref.att] (SrA): Frequency reference reached ☐ [Th.mot. att.] (tSA): Motor thermal threshold reached ([Motor therm. level] (ttd) parameter in the [SETTINGS] (SEt-) menu, page 39) ☐ [4-20mA] (APL): Loss of 4-20 mA signal, even if [4-20mA loss] (LFL) = [No] (nO), page 95 ☐ [LI1] to [LI6] (LI1) to (LI6): Returns the value of the selected logic input The relay is energized when the selected assignment is active, with the exception of [No drive flt] (FLt) (energized if the drive has not detected a fault).		[No drive flt] (FLt)
r2	❏ **[R2 Assignment]** ☐ [No] (nO): Not assigned ☐ [No drive flt] (FLt): No drive detected fault ☐ [Drv running] (rUn): Drive running ☐ [Freq.Th.att.] (FtA): Frequency threshold reached ([Freq. threshold] (Ftd) parameter in the [SETTINGS] (SEt-) menu, page 39) ☐ [HSP attain.] (FLA): [High speed] (HSP) reached ☐ [I attained] (CtA): Current threshold reached ([Current threshold] (Ctd) parameter in the [SETTINGS] (SEt-) menu, page 39) ☐ [Freq.ref.att] (SrA): Frequency reference reached ☐ [Th.mot. att.] (tSA): Motor thermal threshold reached ([Motor therm. level] (ttd) parameter in the [SETTINGS] (SEt-) menu, page 39) ☐ [Brk control] (bLC): Brake sequence (for information, as this assignment can only be activated or deactivated from the [APPLICATION FUNCT.] (FUn-) - menu, page 84) ☐ [4-20mA] (APL): Loss of 4-20 mA signal, even if [4-20mA loss] (LFL) = [No] (nO), page 95 ☐ [LI1] to [LI6] (LI1)to (LI6): Returns the value of the selected logic input The relay is energized when the selected assignment is active, with the exception of [No drive flt] (FLt) (energized if the drive has not detected a fault).		[No] (nO)
SCS 2 s	❏ **[Saving config.]** (1) See page 45.		nO
CFG 2 s	❏ **[Macro configuration]** (1) See page 45.		Std
FCS 2 s	❏ **[Restore config.]** (1) See page 46.		nO

(1) [Saving config.] (SCS), [Macro configuration] (CFG), and [Restore config.] (FCS) can be accessed from several configuration menus, but they apply to all menus and parameters.

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

[COMMAND] (CtL-) menu

rEF-
SEt-
drC-
i-O-
CtL-
Fun-
FLt-
CoM-
SuP-



Function access level

Return to factory settings/Restore configuration

The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote display terminal, this menu can be accessed with the switch in the position.

Control and reference channels

Run commands (forward, reverse, etc.) and references can be sent using the following channels:

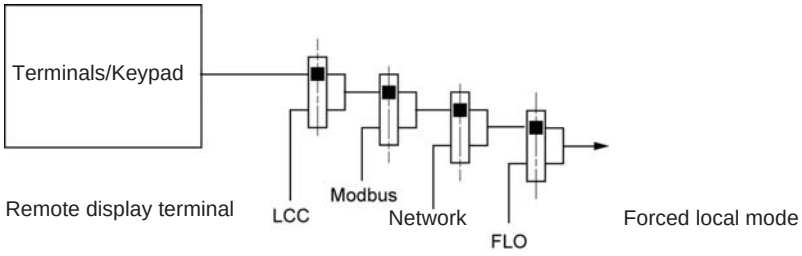
Command CMD	Reference rFr
tEr: Terminals (LI.)	AIx: Terminals
LCC: Remote display terminal (RJ45 socket)	LCC: ATV312 keypad or remote display terminal
LOC: Control via the keypad	AIV1: Jog dial
Mdb: Modbus (RJ45 socket)	Mdb: Modbus (RJ45 socket)
nEt: Network	nEt: Network

The [ACCESS LEVEL] (LAC) parameter in the [COMMAND] (CtL-) menu, page 58, can be used to select priority modes for the control and reference channels. It has 3 function levels:

- [ACCESS LEVEL] (LAC) [Level 1] (L1): = Basic functions. The channels are managed in order of priority.
- [ACCESS LEVEL] (LAC) [Level 2] (L2): = Provides the option of additional functions compared with [Level 1] (L1):
  - +/- speed (motorized jog dial)
  - Brake control
  - 2nd current limit switching
  - Motor switching
  - Management of limit switches
- [ACCESS LEVEL] (LAC) [Level 3] (L3): = Same functions as with [Level 2] (L2). Management of the control and reference channels is configurable.

These channels can be combined in order of priority if [ACCESS LEVEL] (LAC) = [Level 1] (L1) or [Level 2] (L2).

Highest priority to lowest priority: Forced local mode, Network, Modbus, Remote display terminal, Terminals/Keypad (from right to left in the diagram below)

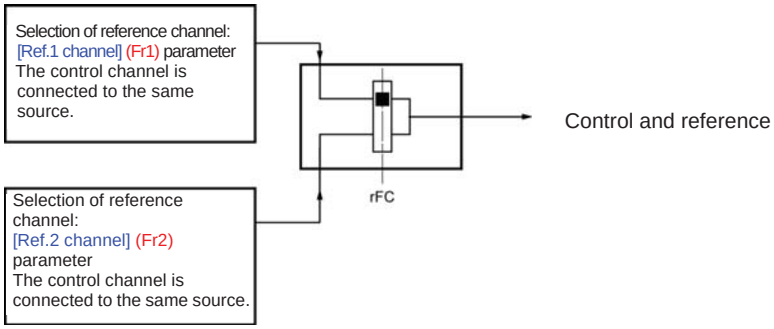


See the detailed block diagrams on pages 53 and 54.

- On ATV312 drives, in factory settings mode, control and reference are managed by the terminals.
- With a remote terminal display, if [HMI command] (LCC) = [Yes] (YES) ([COMMAND] (CtL-) menu), control and reference are managed by the remote terminal display (reference via [HMI Frequency ref.] (LFr) in the [SETTINGS] (SEt-) menu).

The channels can be combined by configuration if [ACCESS LEVEL] (LAC) = [Level 3] (L3).

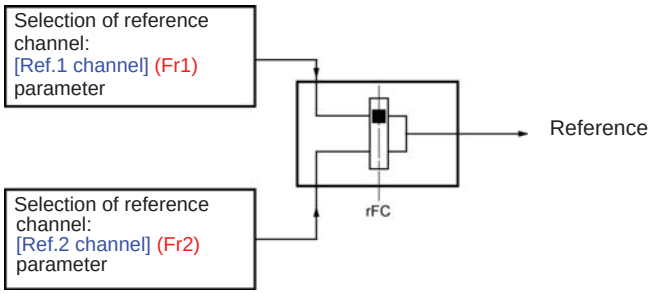
Combined control and reference ([Profile] (CHCF) parameter = [Not separ.] (SIM)):



The [Ref. 2 switching] (rFC) parameter can be used to select the [Ref.1 channel] (Fr1) or [Ref.2 channel] (Fr2) channel, or to configure a logic input or a control word bit for remote switching of either one.
See the detailed block diagrams on pages 55 and 57.

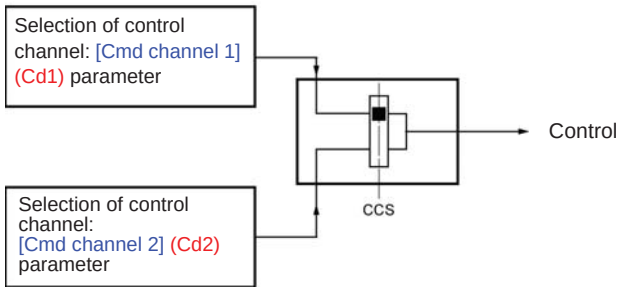
Separate control and reference ([Profile] (CHCF) parameter = [Separate] (SEP)):

Reference



The [Ref. 2 switching] (rFC) parameter can be used to select the [Ref.1 channel] (Fr1) or [Ref.2 channel] (Fr2) channel, or to configure a logic input or a control word bit for remote switching of either one.

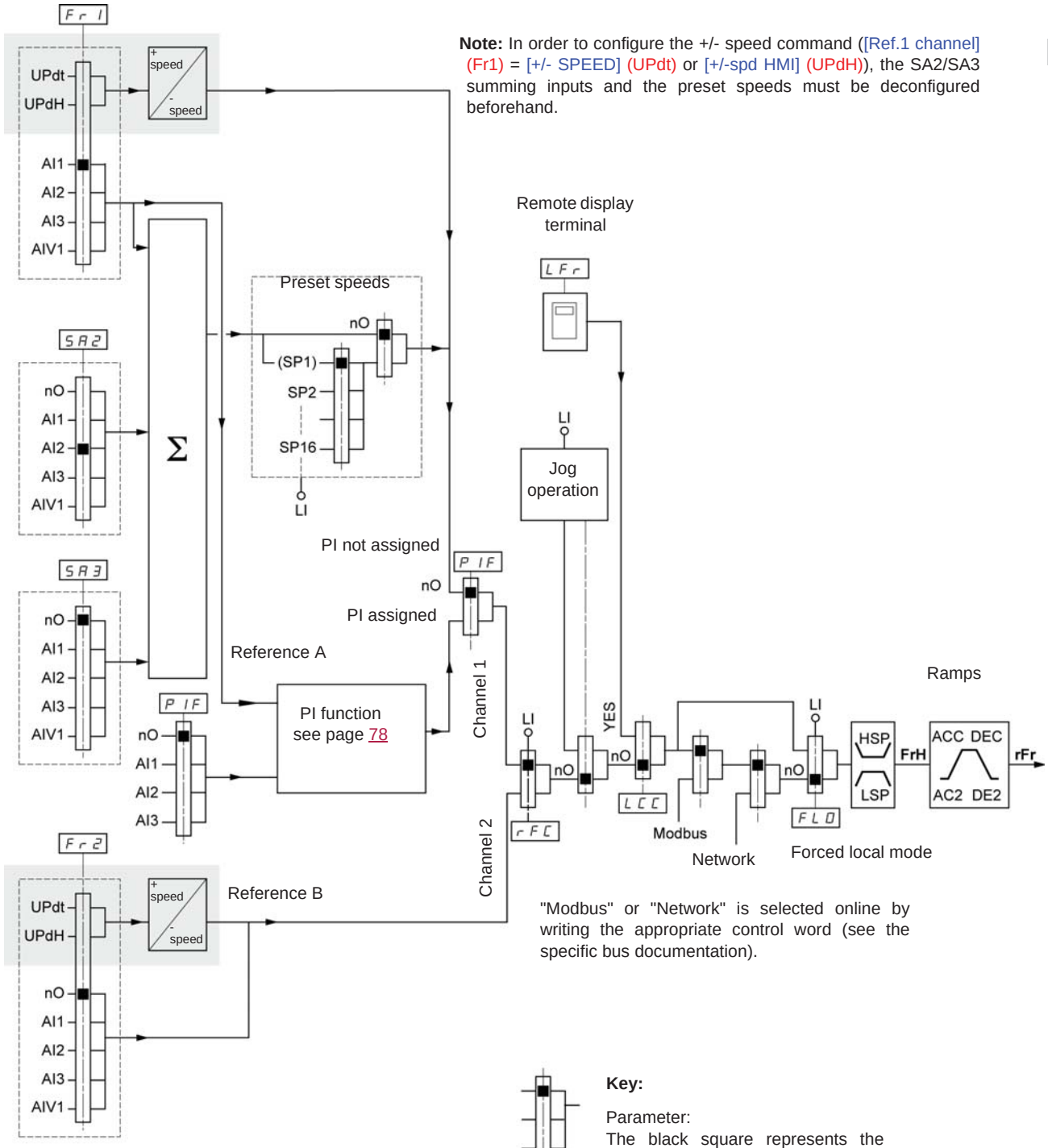
Control



The [Cmd switching] (CCS) parameter, page 60, can be used to select the [Cmd channel 1] (Cd1) or [Cmd channel 2] (Cd2) channel, or to configure a logic input or a control bit for remote switching of either one.

See the detailed block diagrams on pages 55 and 56.

Reference channel for [ACCESS LEVEL] (LAC) = [Level 1] (L1) or [Level 2] (L2)



Note: In order to configure the +/- speed command ([Ref.1 channel] (Fr1) = [+/- SPEED] (UPdt) or [+/-spd HMI] (UPdH)), the SA2/SA3 summing inputs and the preset speeds must be deconfigured beforehand.

"Modbus" or "Network" is selected online by writing the appropriate control word (see the specific bus documentation).

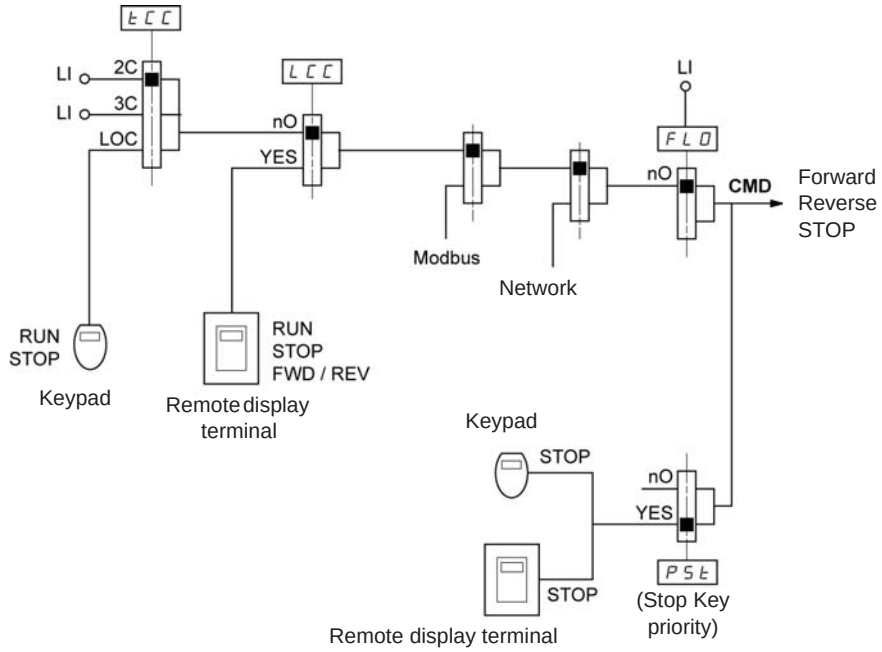
Key:

Parameter:
The black square represents the factory setting assignment.

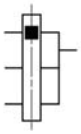
Function can be accessed for [ACCESS LEVEL] (LAC) = [Level 2] (L2)

Control channel for [ACCESS LEVEL] (LAC) = [Level 1] (L1) or [Level 2] (L2)

The [Forced local assign.] (FLO) parameter, page 99, the [HMI command] (LCC) parameter, page 61, and the selection of the Modbus bus or network are common to the reference and control channels.
Example: If [HMI command] (LCC) = [Yes] (YES), the command **and** reference are given by the remote display terminal.



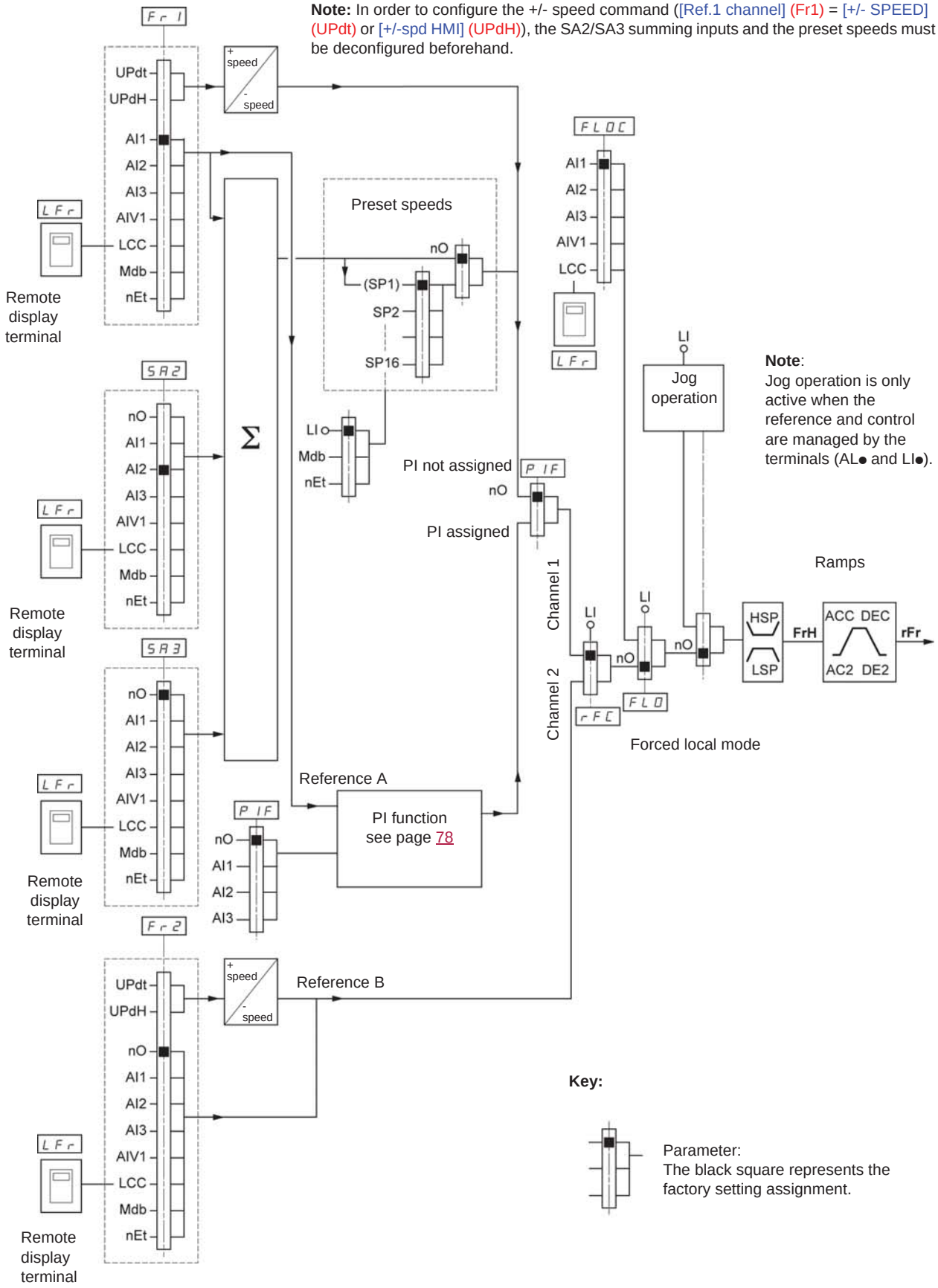
Key:



Parameter:
The black square represents the factory setting assignment

Reference channel for [ACCESS LEVEL] (LAC) = [Level 3] (L3)

Note: In order to configure the +/- speed command ([Ref.1 channel] (Fr1) = [+/- SPEED] (UPdt) or [+/-spd HMI] (UPdH)), the SA2/SA3 summing inputs and the preset speeds must be deconfigured beforehand.



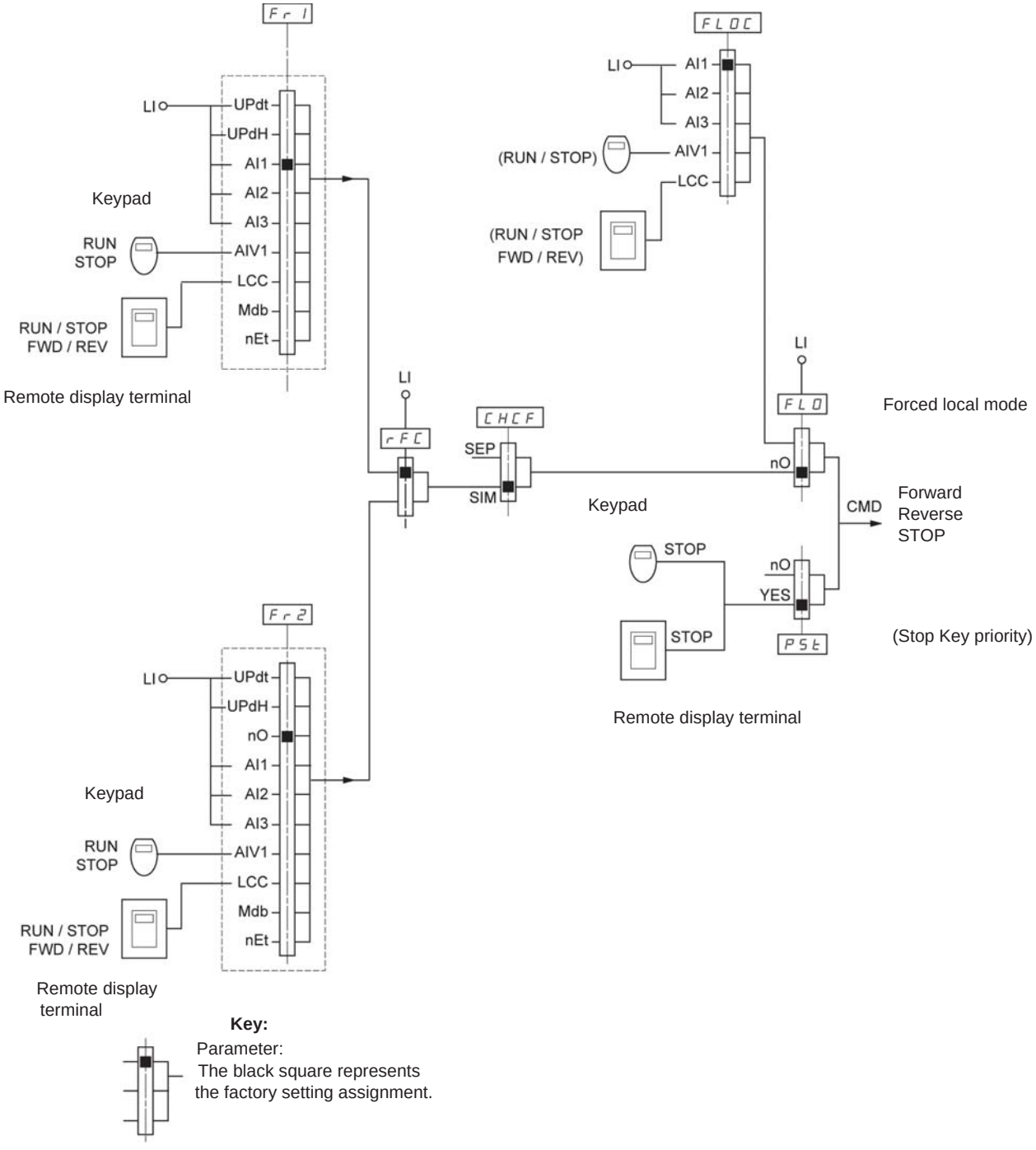
Note:
Jog operation is only active when the reference and control are managed by the terminals (AL● and LI●).

Control channel for [ACCESS LEVEL] (LAC) = [Level 3] (L3)

Combined reference and control

The [Ref.1 channel] (Fr1) parameter, page 58, the [Ref.2 channel] (Fr2) parameter, page 58, the [Ref. 2 switching] (rFC) parameter, page 59, the [Forced local assign.] (FLO) parameter, page 99, and the [Forced local Ref.] (FLOC) parameter, page 99, are common to reference and control. The control channel is therefore determined by the reference channel.

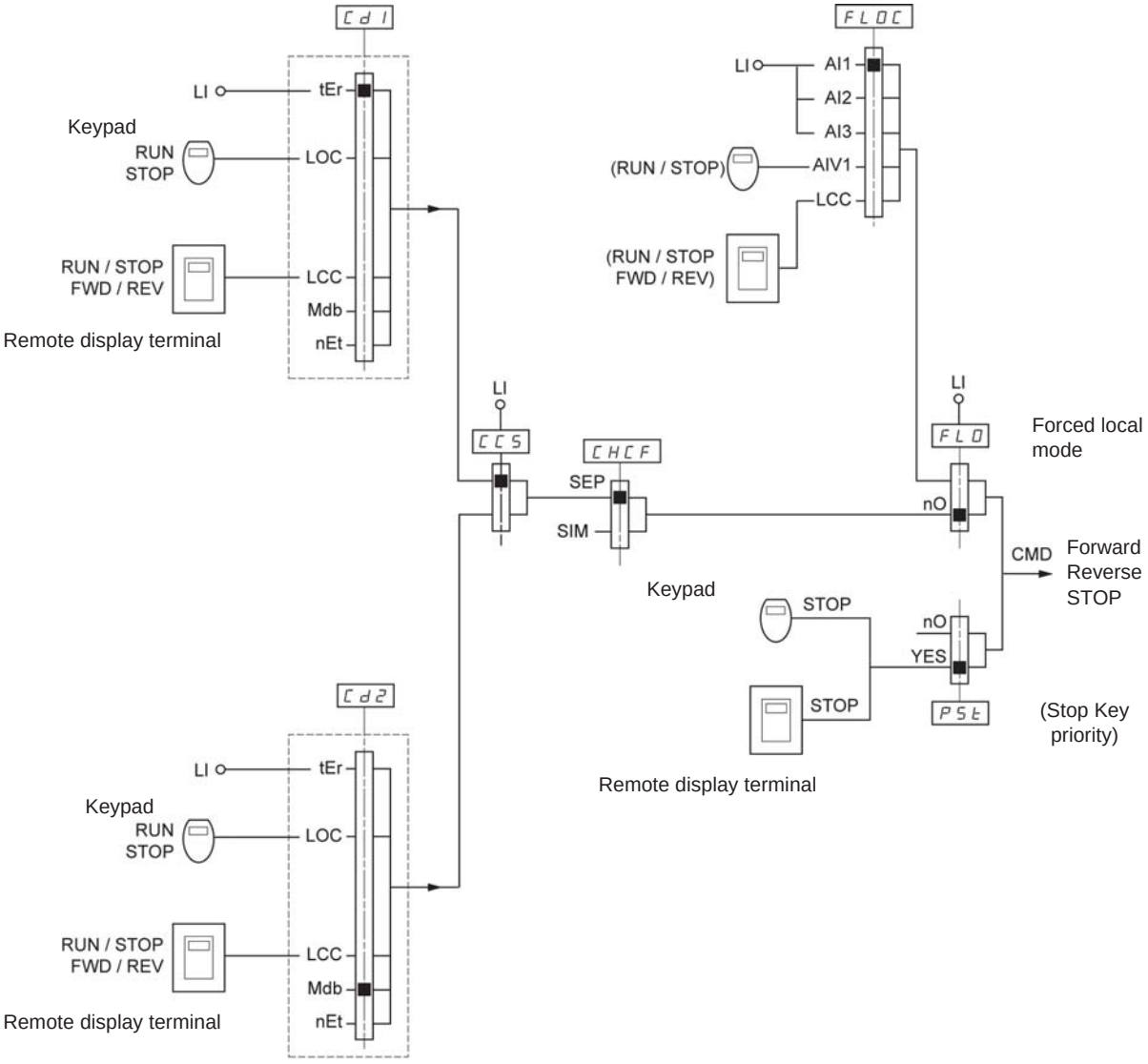
Example: If the [Ref.1 channel] (Fr1) reference = [AI1] (AI1) (analog input at the terminals), control is via LI (logic input at the terminals).



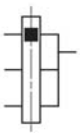
Control channel for [ACCESS LEVEL] (LAC) = [Level 3] (L3)

Mixed mode (separate reference and control)

The [Forced local assign.] (FLO) parameter, page 99, and the [Forced local Ref.] (FLOC) parameter, page 99, are common to reference and control.
Example: If the reference is in forced local mode via [AI1] (AI1) (analog input at the terminals), control in forced local mode is via LI (logic input at the terminals).



Key:



Parameter:
The black square represents
the factory setting assignment.

[COMMAND] (CtL-) menu

rEF-
SEt-
drC-
i-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Note: There may be an incompatibility between functions (see the incompatibility table, page 21). In this case, the first function configured will prevent the remainder being configured.

Code	Description	Adjustment range	Factory setting
LAC	❏ **[ACCESS LEVEL]**		[Level 1] (L1)
	⚠ DANGER **UNINTENDED EQUIPMENT OPERATION** • Assigning **[ACCESS LEVEL] (LAC)** to **[Level 3] (L3)** will restore the factory settings of the **[Ref.1 channel] (Fr1)** parameter, page 58, the **[Cmd channel 1] (Cd1)** parameter, page 59, the **[Profile] (CHCF)** parameter, page 59, and the **[2/3 wire control] (tCC)** parameter, page 47. • **[Level 3] (L3)** can only be restored to **[Level 2] (L2)** or **[Level 1] (L1)**, and **[Level 2] (L2)** can only be restored to **[Level 1] (L1)** by means of a "factory setting" via **[Restore config.] (FCS)**, page 46. • Check that this change is compatible with the wiring diagram used. **Failure to follow these instructions will result in death or serious injury.**		
2 s			
L1	☐ [Level 1] (L1): Access to standard functions and channel management in order of priority.		
L2	☐ [Level 2] (L2):Access to advanced functions in the [APPLICATION FUNCT.] (FUn-) menu: - - +/- speed (motorized jog dial) - Brake control - 2nd current limit switching - Motor switching - Management of limit switches		
L3	☐ [Level 3] (L3): Access to advanced functions and management of mixed control modes		
Fr1	❏ **[Ref.1 channel]** See page 29.		[AI1] (AI1)
Fr2	❏ **[Ref.2 channel]**		[No] (nO)
nO	☐ [No] (nO): Not assigned		
AI1	☐ [AI1] (AI1): Analog input AI1		
AI2	☐ [AI2] (AI2): Analog input AI2		
AI3	☐ [AI3] (AI3): Analog input AI3		
AIV1	☐ [AI Virtual 1] (AIV1): Jog dial If [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), the following additional assignments are possible:		
UPdt	☐ [+/-Speed] (UPdt): (1) +/- speed reference via LI. See configuration page 77.		
UPdH	☐ [+/-spd HMI] (UPdH): (1) +/- speed reference via the jog dial on the ATV312 keypad. To use, display the frequency [Output frequency] (rFr), page 101. The +/- speed function via the keypad or the terminal is controlled from the [MONITORING] (SUP-) menu by selecting the [Output frequency] (rFr) parameter. If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following additional assignments are possible:		
LCC	☐ [HMI] (LCC): Reference via the remote display terminal, [HMI Frequency ref.] (LFr) parameter in the [SETTINGS] (SEt-) menu, page 32.		
ndb	☐ [Modbus] (Mdb): Reference via Modbus		
nEt	☐ [Com. card] (nEt): Reference via network		

(1) NOTE:

- It is not possible to simultaneously assign [+/- SPEED] (UPdt) to [Ref.1 channel] (Fr1) or [Ref.2 channel] (Fr2), and [+/-spd HMI] (UPdH) to [Ref.1 channel] (Fr1) or [Ref.2 channel] (Fr2). Only one of the [+/- SPEED] (UPdt)/[+/-spd HMI] (UPdH) assignments is permitted on each reference channel.
- The +/- speed function in [Ref.1 channel] (Fr1) is incompatible with several functions (see page 21). It can only be configured if these functions are unassigned, in particular the summing inputs (set [Summing ref. 2] (SA2) to [No] (nO), page 70) and the preset speeds (set [2 preset speeds] (PS2) and [4 preset speeds] (PS4) to [No] (nO), page 72) which will have been assigned as part of the factory settings.
- In [Ref.2 channel] (Fr2), the +/- speed function is compatible with the preset speeds, summing inputs, and the PI regulator.

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

Code	Description	Adjustment range	Factory setting
rFC	❏ **[Ref. 2 switching]** The [Ref. 2 switching] (rFC) parameter can be used to select the [Ref.1 channel] (Fr1) or [Ref.2 channel] (Fr2) channel, or to configure a logic input or a control word bit for remote switching of [Ref.1 channel] (Fr1) or [Ref.2 channel] (Fr2). ☐ Fr1: [ch1 active] (Fr1): Reference = reference 1 ☐ Fr2: [ch1 active] (Fr2): Reference = reference 2 ☐ LI1: [LI1] (LI1): Logic input LI1 ☐ LI2: [LI2] (LI2): Logic input LI2 ☐ LI3: [LI3] (LI3): Logic input LI3 ☐ LI4: [LI4] (LI4): Logic input LI4 ☐ LI5: [LI5] (LI5): Logic input LI5 ☐ LI6: [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following additional assignments are possible: ☐ C111: [C111] (C111): Bit 11 of Modbus control word ☐ C112: [C112] (C112): Bit 12 of Modbus control word ☐ C113: [C113] (C113): Bit 13 of Modbus control word ☐ C114: [C114] (C114): Bit 14 of Modbus control word ☐ C115: [C115] (C115): Bit 15 of Modbus control word ☐ C211: [C211] (C211): Bit 11 of network control word ☐ C212: [C212] (C212): Bit 12 of network control word ☐ C213: [C213] (C213): Bit 13 of network control word ☐ C214: [C214] (C214): Bit 14 of network control word ☐ C215: [C215] (C215): Bit 15 of network control word The reference can be switched with the drive running. [Ref.1 channel] (Fr1) is active when the logic input or control word bit is at state 0. [Ref.2 channel] (Fr2) is active when the logic input or control word bit is at state 1.		[ch1 active] (Fr1)
CHCF	❏ **[Profile]** (control channels separated from reference channels) Parameter can be accessed if [ACCESS LEVEL] (LAC) = [Level 3] (L3), page 58. ☐ SIM: [Not separ.] (SIM): Combined ☐ SEP: [Separate] (SEP): Separate		[Not separ.] (SIM)
Cd1 ★	❏ **[Cmd channel 1]** Parameter can be accessed if [Profile] (CHCF) = [Separate] (SEP), page 59, and [ACCESS LEVEL] (LAC) = [Level 3] (L3), page 58. ☐ tEr: [Terminal] (tEr): Control via terminals ☐ LoC: [Local] (LOC): Control via keypad ☐ LCC: [Remot. HMI] (LCC): Control via remote display terminal ☐ Mdb: [Modbus] (Mdb): Control via Modbus ☐ nEt: [Com. card] (nEt): Control via the network		[Terminal] (tEr)

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[COMMAND] (CtL-) menu

Code	Description	Adjustment range	Factory setting
Cd2 ★ tEr LoC LCC ndb nEt	❑ **[Cmd channel 2]** Parameter can be accessed if [Profile] (CHCF) = [Separate] (SEP), page 59, and [ACCESS LEVEL] (LAC) = [Level 3] (L3), page 58. ☐ [Terminal] (tEr): Control via terminals ☐ [Local] (LOC): Control via keypad ☐ [Remot. HMI] (LCC): Control via remote display terminal ☐ [Modbus] (Mdb): Control via Modbus ☐ [Com. card (nEt): Control via the network		[Modbus] (Mdb)
CCS ★ Cd1 Cd2 LI1 LI2 LI3 LI4 LI5 LI6 C111 C112 C113 C114 C115 C211 C212 C213 C214 C215	❑ **[Cmd switching]** Parameter can be accessed if [Profile] (CHCF) = [Separate] (SEP), page 59, and [ACCESS LEVEL] (LAC) = [Level 3] (L3), page 58. The [Cmd switching] (CCS) parameter can be used to select the [Cmd channel 1] (Cd1) or [Cmd channel 2] (Cd2) channel, or to configure a logic input or a control word bit for remote switching of [Cmd channel 1] (Cd1) or [Cmd channel 2] (Cd2). ☐ [ch1 active] (Cd1): Control channel = channel 1 ☐ [ch2 active] (Cd2): Control channel = channel 2 ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 ☐ [C111] (C111): Bit 11 of Modbus control word ☐ [C112] (C112): Bit 12 of Modbus control word ☐ [C113] (C113): Bit 13 of Modbus control word ☐ [C114] (C114): Bit 14 of Modbus control word ☐ [C115] (C115): Bit 15 of Modbus control word ☐ [C211] (C211): Bit 11 of network control word ☐ [C212] (C212): Bit 12 of network control word ☐ [C213] (C213): Bit 13 of network control word ☐ [C214] (C214): Bit 14 of network control word ☐ [C215] (C215): Bit 15 of network control word Channel 1 is active when the input or control word bit is at state 0, Channel 2 is active when the input or control word bit is at state 1.		[ch1 active] (Cd1)
CoP no SP Cd ALL	❑ **[Copy channel 1<>2]** (copy only in this direction) **⚠ DANGER** **UNINTENDED EQUIPMENT OPERATION** Copying the command and/or reference can change the direction of rotation. • Check that this is safe. **Failure to follow these instructions will result in death or serious injury.** Parameter can be accessed if [ACCESS LEVEL] (LAC) = [Level 3] (L3), page 58. ☐ [No] (nO): No copy ☐ [Reference] (SP): Copy reference ☐ [Command] (Cd): Copy control ☐ [Cmd + ref.] (ALL): Copy control and reference • If channel 2 is controlled via the terminals, channel 1 control is not copied. • If the channel 2 reference is set via AI1, AI2, AI3 or AIU1, the channel 1 reference is not copied. • The reference copied is [Frequency ref.] (FrH) (before ramp), unless the channel 2 reference is set via +/- speed. In this case, the reference copied is [Output frequency] (rFr) (after ramp). **Note:** Copying the control and/or reference can change the direction of rotation.		[No] (nO)

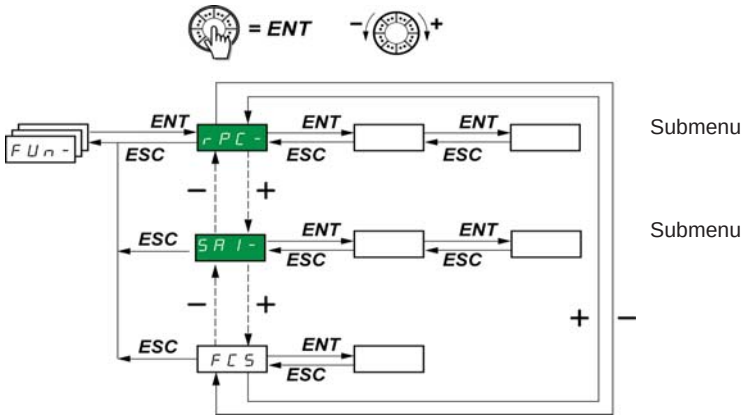
★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[COMMAND] (CtL-) menu

Code	Description	Adjustment range	Factory setting
LCC nO YES	❑ **[HMI command]** Parameter can only be accessed using a remote display terminal, and for [ACCESS LEVEL] (LAC) = [Level 1] (L1) or [Level 2] (L2), page 58. ☐ [No] (nO): Function inactive ☐ [Yes] (YES): Enables control of the drive using the STOP/RESET, RUN and FWD/REV buttons on the display terminal. Here, the speed reference is given by the [HMI Frequency ref.] (LFr) parameter in the [SETTINGS] (SEt-) menu. Only the freewheel stop, fast stop and DC injection stop commands remain active on the terminals. If the drive/terminal connection is cut or if the terminal has not been connected, the drive detects a fault and locks in [MODBUS FAULT] (SLF).		[No] (nO)
PSt 2 s nO YES	❑ **[Stop Key priority]** This parameter can be used to activate or deactivate the stop button on the drive and the remote terminals. The stop button will be deactivated if the active control channel is different from that on the integrated display terminal or remote terminals. **⚠ WARNING** **LOSS OF CONTROL** You are going to disable the stop button located on the drive and remote display Do not select "**nO**" unless exterior stopping methods exist. **Failure to follow these instructions can result in death, serious injury, or equipment damage.** ☐ [No] (nO): Function inactive ☐ [Yes] (YES): STOP key priority		[Yes] (YES)
rot dFr drS bot	❑ **[Rotating direction]** This parameter is only visible if [Ref.1 channel] (Fr1), page 29, or [Ref.2 channel] (Fr2), page 58, are assigned to LCC or AIU1. Direction of operation authorized for the RUN key on the keypad or the RUN key on the remote display terminal. ☐ [Forward] (dFr): Forward ☐ [Reverse] (drS): Reverse ☐ [Both] (bOt): Both directions are authorized.		[Forward] (dFr)
SCS 2 s	❑ **[Saving config.]** See page 45.	(1)	nO
CFG 2 s	❑ **[Macro configuration]** See page 45.	(1)	Std
FCS 2 s	❑ **[Restore config.]** See page 46.	(1)	nO

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

(1) [Saving config.] (SCS), [Macro configuration] (CFG), and [Restore config.] (FCS) can be accessed from several configuration menus, but they apply to all menus and parameters.



The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote display terminal, this menu can be accessed with the switch in the position.

Some functions have numerous parameters. In order to clarify programming and avoid having to scroll through endless parameters, these functions have been grouped in submenus.
Like menus, submenus are identified by a dash after their code: PSS- for example.

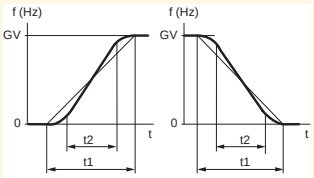
Note: There may be an incompatibility between functions (see the incompatibility table, page 21). In this case, the first function configured will prevent the remainder being configured.

Code	Name/Description	Adjustment range	Factory setting
rPC-	**[RAMPS]**		
rPt	**[Ramp type]**		[Linear] (LIn)

Defines the shape of the acceleration and deceleration ramps

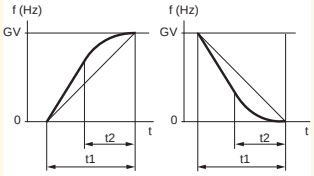
- ☐ [Linear] (LIn): Linear
- ☐ [S ramp] (S): S ramp
- ☐ [U ramp] (U): U ramp
- ☐ [Customized] (CUS): Customized

S ramps



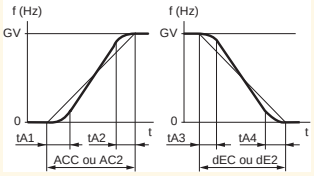
The rounding coefficient is fixed,
where t2 = 0.6 x t1
and t1 = set ramp time.

U ramps



The rounding coefficient is fixed,
where t2 = 0.5 x t1
and t1 = set ramp time.

Customized ramps



tA1: Adjustable from 0 to 100% (of ACC or AC2)
tA2: Adjustable from 0 to (100% - tA1) (of ACC or AC2)
tA3: Adjustable from 0 to 100% (of dEC or dE2)
tA4: Adjustable from 0 to (100% - tA3) (of dEC or dE2)

Code	Name/Description	Adjustment range	Factory setting
rPC-	**[RAMPS]** (continued)		
tA1 ★	❏ **[Begin Acc round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to 100	10
tA2 ★	❏ **[End Acc round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to (100-tA1)	10
tA3 ★	❏ **[Begin Dec round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to 100	10
tA4 ★	❏ **[End Dec round]** Parameter can be accessed if the [Ramp type] (rPt) = [Customized] (CUS), page 62.	0 to (100-tA3)	10
inr 0.01 0.1 1	❏ **[Ramp increment]** ☐ [0.01] (0.01): Ramp can be set between 0.05 s and 327.6 s. ☐ [0.1] (0.1): Ramp can be set between 0.1 s and 3,276 s. ☐ [1] (1): Ramp can be set between 1 s and 32,760 s (1). This parameter applies to the [Acceleration] (ACC), [Deceleration] (dEC), [Acceleration 2] (AC2), and [Deceleration 2] (dE2) parameters. **Note:** Changing the [Ramp increment] (Inr) parameter causes the settings for the [Acceleration] (ACC), [Deceleration] (dEC), [Acceleration 2] (AC2), and [Deceleration 2] (dE2) parameters to be modified as well.	0.01 - 0.1 - 1	0.1
ACC dEC	❏ **[Acceleration]** (2) ❏ **[Deceleration]** Defined to accelerate/decelerate between 0 and the nominal frequency [Rated motor freq.] (FrS) (parameter in the [MOTOR CONTROL] (drC-) menu). Check that the value for [Deceleration] (dEC) is not too low in relation to the load to be stopped.	In accordance with inr, page 63	3 s 3 s

(1) When values higher than 9,999 are displayed on the drive or on the remote display terminal, a point is inserted after the thousands digit.
Note:
This type of display can lead to confusion between values which have two digits after a decimal point and values higher than 9,999. Check the value of the [Ramp increment] (Inr) parameter.
Example:
- If [Ramp increment] (Inr) = 0.01, the value 15.65 corresponds to a setting of 15.65 s.
- If [Ramp increment] (Inr) = 1, the value 15.65 corresponds to a setting of 15,650 s.

(2) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
rPC-	**[RAMPS]** (continued)		
rPS	**❑ [Ramp switch ass.]**		[No] (nO)

This function remains active regardless of the control channel.
- ☐ [No] (nO): Not assigned
- ☐ [LI1] (LI1): Logic input LI1
- ☐ [LI2] (LI2): Logic input LI2
- ☐ [LI3] (LI3): Logic input LI3
- ☐ [LI4] (LI4): Logic input LI4
- ☐ [LI5] (LI5): Logic input LI5
- ☐ [LI6] (LI6): Logic input LI6

If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible:
- ☐ [CD11] (CD11): Bit 11 of the control word from a communication network
- ☐ [CD12] (CD12): Bit 12 of the control word from a communication network
- ☐ [CD13] (CD13): Bit 13 of the control word from a communication network
- ☐ [CD14] (CD14): Bit 14 of the control word from a communication network
- ☐ [CD15] (CD15): Bit 15 of the control word from a communication network

[Acceleration] (ACC) and [Deceleration] (dEC) are enabled when the logic input or control word bit is at state 0. [Acceleration 2] (AC2) and [Deceleration 2] (dE2) are enabled when the logic input or control word bit is at state 1.

Frt	**❑ [Ramp 2 threshold]**	0 to 500 Hz	0 Hz

The 2nd ramp is switched if [Ramp 2 threshold]] (Frt) is not 0 (the value 0 corresponds to the inactive function) and the output frequency is higher than [Ramp 2 threshold]] (Frt).
Threshold ramp switching can be combined with switching via LI or bit as follows:

LI or bit	Frequency	Ramp
0	<Frt	ACC, dEC
0	>Frt	AC2, dE2
1	<Frt	AC2, dE2
1	>Frt	AC2, dE2

AC2 ★	**❑ [Acceleration 2]** (1)	In accordance with inr, page 63	5

Parameter can be accessed if [Ramp 2 threshold] (Frt) > 0, page 64, or if [Ramp switch ass.] (rPS) is assigned, page 64.

dE2 ★	**❑ [Deceleration 2]** (1)	In accordance with inr, page 63	5

Parameter can be accessed if [Ramp 2 threshold] (Frt) > 0, page 64, or if [Ramp switch ass.] (rPS) is assigned, page 64.

brA	**❑ [Dec ramp adapt.]**		[Yes] (YES)

Activating this function automatically adapts the deceleration ramp, if this has been set at too low a value for the inertia of the load.
- ☐ [No] (nO): Function inactive
- ☐ [Yes] (YES): Function active. The function is incompatible with applications requiring:
  - Positioning on a ramp
  - The use of a braking resistor (the resistor would not operate correctly)

[Dec ramp adapt.] (brA) is forced to [No] (nO) if brake control [Brake assignment] (bLC) is assigned, page 84.

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
StC-	**[STOP MODES]** (continued)		
Stt	**[Type of stop]**		[Ramp stop] (rMP)
	Stop mode on disappearance of the run command or appearance of a stop command. ☐ [Ramp stop] (rMP): On ramp ☐ [Fast stop] (FSt): Fast stop ☐ [Freewheel] (nST): Freewheel stop ☐ [DC injection] (dCI): DC injection stop		
FSt	**[Fast stop]**		[No] (nO)
	☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network The stop is activated when the logic state of the input changes to 0 and the control word bit changes to 1. The fast stop is a stop on a reduced ramp via the [Ramp divider] (dCF) parameter. If the input falls back to state 1 and the run command is still active, the motor will only restart if 2-wire level control has been configured [2/3 wire control] (tCC) = [2 wire] (2C), and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO), page 47). In other cases, a new run command must be sent.		
dCF ★	**[Ramp divider]**	0 to 10	4
	Parameter can be accessed where [Type of stop] (Stt) = [Fast stop] (FSt), page 65, and where [Fast stop] (FSt) is not [No] (nO), page 65. Ensure that the reduced ramp is not too low in relation to the load to be stopped. The value 0 corresponds to the minimum ramp.		

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
StC-	**[STOP MODES]** (continued)		
dC1	**[DC injection assign.]**		[No] (nO)

WARNING

NO HOLDING TORQUE

- DC injection braking does not provide any holding torque at zero speed.
- DC injection braking does not work when there is a loss of power or when the drive detects a fault.
- Where necessary, use a separate brake to maintain torque levels.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Note1: This function is incompatible with the "Brake control" function (see page 21).
Note2: The DC injection stop is not effective when the drive is stopped with the JOG function activated.

- nO: ☐ [No] (nO): Not assigned
- LI1: ☐ [LI1] (LI1): Logic input LI1
- LI2: ☐ [LI2] (LI2): Logic input LI2
- LI3: ☐ [LI3] (LI3): Logic input LI3
- LI4: ☐ [LI4] (LI4): Logic input LI4
- LI5: ☐ [LI5] (LI5): Logic input LI5
- LI6: ☐ [LI6] (LI6): Logic input LI6

If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible:

- Cd11: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network
- Cd12: ☐ [CD12] (CD12): Bit 12 of the control word from a communication network
- Cd13: ☐ [CD13] (CD13): Bit 13 of the control word from a communication network
- Cd14: ☐ [CD14] (CD14): Bit 14 of the control word from a communication network
- Cd15: ☐ [CD15] (CD15): Bit 15 of the control word from a communication network

Braking is activated when the logic state of the input or control word bit is at 1.

IdC ★	**[DC inject. level 1]**	(1)(3)	0 to In (2)	0.7 In (2)

CAUTION

RISK OF DAMAGE TO MOTOR

- Check that the motor will withstand this current without overheating.

Failure to follow these instructions can result in equipment damage.

Parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI), page 65, or if [DC injection assign.] (dCI) is not set to [No] (nO), page 66.
After 5 seconds, the injection current is limited to 0.5 [Mot. therm. current] (ItH) if set to a higher value.

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.
(3) **Note:** These settings are not related to the "automatic standstill DC injection" function.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
StC-	**[STOP MODES]** (continued)		
tdC	❏ **[DC injection time 2]** (1)(3)	0.1 to 30 s	0.5 s
	CAUTION **RISK OF DAMAGE TO MOTOR** • Long periods of DC injection braking can cause overheating and damage the motor. • Protect the motor by avoiding long periods of DC injection braking. **Failure to follow these instructions can result in equipment damage.**		
★	Parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI) , page 65.		
nSt	❏ **[Freewheel stop ass.]**		[No] (nO)
nO LI1 LI2 LI3 LI4 LI5 LI6	☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 The stop is activated when the logic state of the input is at 0. If the input falls back to state 1 and the run command is still active, the motor will only restart if 2-wire level control has been configured. In other cases, a new run command must be sent.		

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.
(3) **Note:** These settings are not related to the "automatic standstill DC injection" function.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
AdC-	**[AUTO DC INJECTION]**		
AdC	**❑ [Auto DC injection]**		[Yes] (YES)

If set to [Continuous] (Ct), this parameter causes injection current to be generated, even when there is no run command. This is not compatible with [Auto tuning] (tUn) = [Drv running] (rUn). this parameter can be changed at any time.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

When **[Auto DC injection] (AdC)** = **[Continuous] (Ct),** the injection of current is done even if a run command has not been sent.

- Check this action will not endanger personnel or equipment in any way

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

NO HOLDING TORQUE

- DC injection braking does not provide any holding torque at zero speed.
- DC injection braking does not work when there is a loss of power or when the drive detects a fault.
- Where necessary, use a separate brake to maintain torque levels.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

nO YES Ct

- ☐ [No] (nO): No injection
- ☐ [Yes] (YES): Standstill injection for adjustable period
- ☐ [Continuous] (Ct): Continuous standstill injection

tdC1	**❑ [Auto DC inj. time 1]**	(1)	0.1 to 30 s	0.5 s

CAUTION

RISK OF DAMAGE TO MOTOR

- Long periods of DC injection braking can cause overheating and damage the motor.
- Protect the motor by avoiding long periods of DC injection braking.

Failure to follow these instructions can result in equipment damage.

★ Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68.

SdC1	**❑ [Auto DC inj. level 1]**	(1)	0 to 1.2 In (2)	0.7 In (2)

CAUTION

RISK OF DAMAGE TO MOTOR

- Check that the motor will withstand this current without overheating.

Failure to follow these instructions can result in equipment damage.

★ Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68.
Note: Check that the motor will withstand this current without overheating.

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description		Adjustment range	Factory setting
AdC-	**[AUTO DC INJECTION] (continued)**			
tdC2	❑ **[Auto DC inj. time 2]**	(1)	0 to 30 s	0 s

CAUTION

RISK OF DAMAGE TO MOTOR

- Long periods of DC injection braking can cause overheating and damage the motor.
- Protect the motor by avoiding long periods of DC injection braking.

Failure to follow these instructions can result in equipment damage.

★ Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68.

SdC2	❑ **[Auto DC inj. level 2]**	(1)	0 to 1.2 In (2)	0.5 In (2)

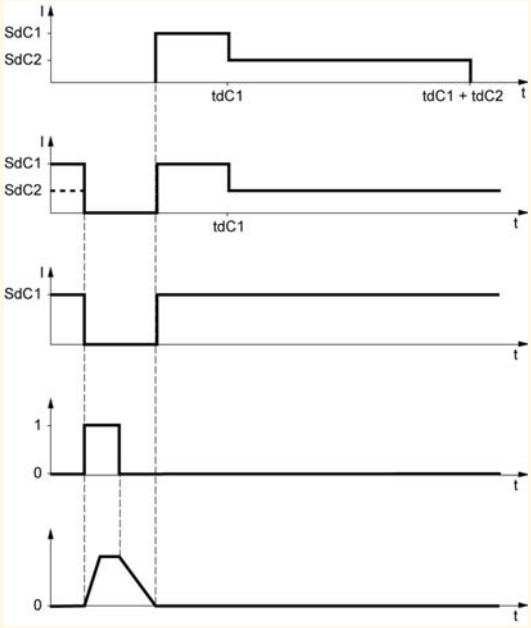
CAUTION

RISK OF DAMAGE TO MOTOR

- Check that the motor will withstand this current without overheating.

Failure to follow these instructions can result in equipment damage.

★ Parameter can be accessed if [Auto DC injection] (AdC) is not set to [No] (nO), page 68.

AdC	SdC2	Operation
YES	x	
Ct	≠ 0	
Ct	= 0	
Run command		
Speed		

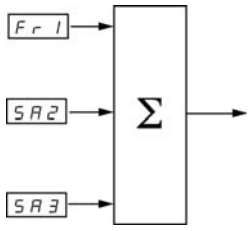
(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

rEF-
SEt-
drC-
I-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Name/Description	Adjustment range	Factory setting
SA1-	**[SUMMING INPUTS]** Can be used to sum one or two inputs to the [Ref.1 channel] (Fr1) reference only. **Note:** The "Summing inputs" function may be incompatible with other functions (see page 21).		
SA2	**[Summing ref. 2]**		[AI2] (AI2)
no	☐ [No] (nO): Not assigned		
AI1	☐ [AI1] (AI1): Analog input AI1		
AI2	☐ [AI2] (AI2): Analog input AI2		
AI3	☐ [AI3] (AI3): Analog input AI3		
AIVI	☐ [AI Virtual 1] (AIV1): Jog dial		
	If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible:		
LCC	☐ [HMI] (LCC): Reference via the remote display terminal, [HMI Frequency ref.] (LFr) parameter in the [SETTINGS] (SEt-) menu, page 32.		
Mdb	☐ [Modbus] (Mdb): Reference via Modbus		
nEt	☐ [Com. card] (nEt): Reference via network		
SA3	**[Summing ref. 3]**		[No] (nO)
no	☐ [No] (nO): Not assigned		
AI1	☐ [AI1] (AI1): Analog input AI1		
AI2	☐ [AI2] (AI2): Analog input AI2		
AI3	☐ [AI3] (AI3): Analog input AI3		
AIVI	☐ [AI Virtual 1] (AIV1): Jog dial		
	If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible:		
LCC	☐ [HMI] (LCC): Reference via the remote display terminal, [HMI Frequency ref.] (LFr) parameter in the [SETTINGS] (SEt-) menu, page 32.		
Mdb	☐ [Modbus] (Mdb): Reference via Modbus		
nEt	☐ [Com. card] (nEt): Reference via network		

Summing inputs



Note:
AI2 is a ± 10 V input which can be used for subtraction by summing a negative signal.

See the complete block diagrams on pages 53 and 55.

Preset speeds

2, 4, 8 or 16 speeds can be preset, requiring 1, 2, 3 or 4 logic inputs respectively.

The following assignment order must be observed: [2 preset speeds] (PS2), then [4 preset speeds] (PS4), then [8 preset speeds] (PS8), then [16 preset speeds] (PS16).

Combination table for preset speed inputs

16 speeds LI (PS16)	8 speeds LI (PS8)	4 speeds LI (PS4)	2 speeds LI (PS2)	Speed reference
0	0	0	0	Reference (1)
0	0	0	1	SP2
0	0	1	0	SP3
0	0	1	1	SP4
0	1	0	0	SP5
0	1	0	1	SP6
0	1	1	0	SP7
0	1	1	1	SP8
1	0	0	0	SP9
1	0	0	1	SP10
1	0	1	0	SP11
1	0	1	1	SP12
1	1	0	0	SP13
1	1	0	1	SP14
1	1	1	0	SP15
1	1	1	1	SP16

(1) See the block diagrams on page 53 and page 55: Reference 1 = (SP1).

Note: If Fr1 = LCC and rPI= nO, then PI reference (%) = 10 * AI (Hz) / 15

Code	Name/Description	Adjustment range	Factory setting
PSS-	**[PRESET SPEEDS]** **Note:** The "Preset speeds" function may be incompatible with other functions (see page 21).		
PS2	**❑ [2 preset speeds]** Selecting the assigned logic input activates the function. ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network		[LI3] (LI3)
PS4	**❑ [4 preset speeds]** Selecting the assigned logic input activates the function. Ensure that [2 preset speeds] (PS2) has been assigned before assigning [4 preset speeds] (PS4). ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network		[LI4] (LI4)
PS8	**❑ [8 preset speeds]** Selecting the assigned logic input activates the function. Ensure that [4 preset speeds] (PS4) has been assigned before assigning [8 preset speeds] (PS8). ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network		[No] (nO)

Code	Name/Description		Adjustment range	Factory setting
PSS-	**[PRESET SPEEDS]** (continued)			
PS16	❏ **[16 preset speeds]** Selecting the assigned logic input activates the function. Ensure that [8 preset speeds] (PS8) has been assigned before assigning [16 preset speeds] (PS16). ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network			[No] (nO)
SP2 ★	❏ **[Preset speed 2]**	(1)	0.0 to 500.0 Hz (2)	10 Hz
SP3 ★	❏ **[Preset speed 3]**	(1)	0.0 to 500.0 Hz (2)	15 Hz
SP4 ★	❏ **[Preset speed 4]**	(1)	0.0 to 500.0 Hz (2)	20 Hz
SP5 ★	❏ **[Preset speed 5]**	(1)	0.0 to 500.0 Hz (2)	25 Hz
SP6 ★	❏ **[Preset speed 6]**	(1)	0.0 to 500.0 Hz (2)	30 Hz
SP7 ★	❏ **[Preset speed 7]**	(1)	0.0 to 500.0 Hz (2)	35 Hz
SP8 ★	❏ **[Preset speed 8]**	(1)	0.0 to 500.0 Hz (2)	40 Hz
SP9 ★	❏ **[Preset speed 9]**	(1)	0.0 to 500.0 Hz (2)	45 Hz
SP10 ★	❏ **[Preset speed 10]**	(1)	0.0 to 500.0 Hz (2)	50 Hz

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu. This parameter will depend on how many speeds have been configured.

(2) Reminder: The speed remains limited by the [High speed] (HSP) parameter, page 33.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[APPLICATION FUNCT.] (FUn-) menu

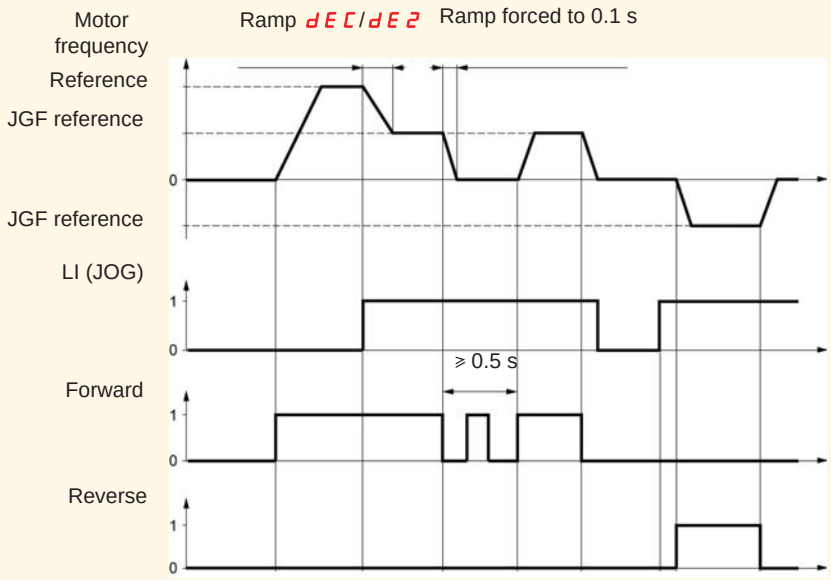
rEF-
SEt-
drC-
I-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Name/Description		Adjustment range	Factory setting
PSS-	■ [PRESET SPEEDS] (continued)			
SP11 ★	❑ [Preset speed 11]	(1)	0.0 to 500.0 Hz (2)	55 Hz
SP12 ★	❑ [Preset speed 12]	(1)	0.0 to 500.0 Hz (2)	60 Hz
SP13 ★	❑ [Preset speed 13]	(1)	0.0 to 500.0 Hz (2)	70 Hz
SP14 ★	❑ [Preset speed 14]	(1)	0.0 to 500.0 Hz (2)	80 Hz
SP15 ★	❑ [Preset speed 15]	(1)	0.0 to 500.0 Hz (2)	90 Hz
SP16 ★	❑ [Preset speed 16]	(1)	0.0 to 500.0 Hz (2)	100 Hz

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu. This parameter will depend on how many speeds have been configured.

(2) Reminder: The speed remains limited by the [High speed] (HSP) parameter, page 33.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
JoG-	**[JOG]** **Note:** The "Jog operation" function may be incompatible with other functions (see page 21).		
JoG	**[JOG]** Selecting the assigned logic input activates the function. ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 Example: 2-wire control operation ([2/3 wire control] (tCC) = [2 wire] (2C))  	[No] (nO)	
JGF ★	**[Jog frequency]** (1) Parameter can be accessed if [JOG] (JOG) is not set to [No] (nO), page 75.	0 to 10 Hz	10 Hz

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

+/- speed

Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), page 58.
Two types of operation are available.

1. **Use of single action buttons:** Two logic inputs are required in addition to the direction(s) of operation.
   The input assigned to the "+ speed" command increases the speed, the input assigned to the "- speed" command decreases the speed.
   Note:
   If the "+ speed" and "- speed" commands are activated at the same time, "- speed" will be given priority.

2. **Use of double action buttons:** Only one logic input assigned to "+ speed" is required.

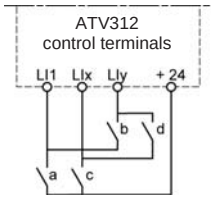
+/- speed with double action buttons:

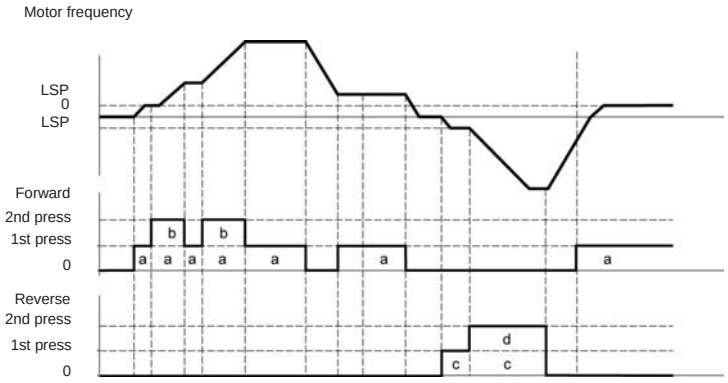
Description: 1 button pressed twice for each direction of rotation. Each action closes a contact.

	Released (- speed)	1st press (speed maintained)	2nd press (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d

Wiring example:

LI1: Forward
LIx: Reverse
LIy: + speed





This type of +/- speed is incompatible with 3-wire control.

Whichever type of operation is selected, the max. speed is set by the [High speed] (HSP) parameter, page 33.

Note:
If the reference is switched via [Ref. 2 switching] (rFC), page 59, from one reference channel to any other reference channel with "+/- speed", the value of the [Output frequency] (rFr) reference (after ramp) is copied at the same time. This prevents the speed being incorrectly reset to zero when switching takes place.

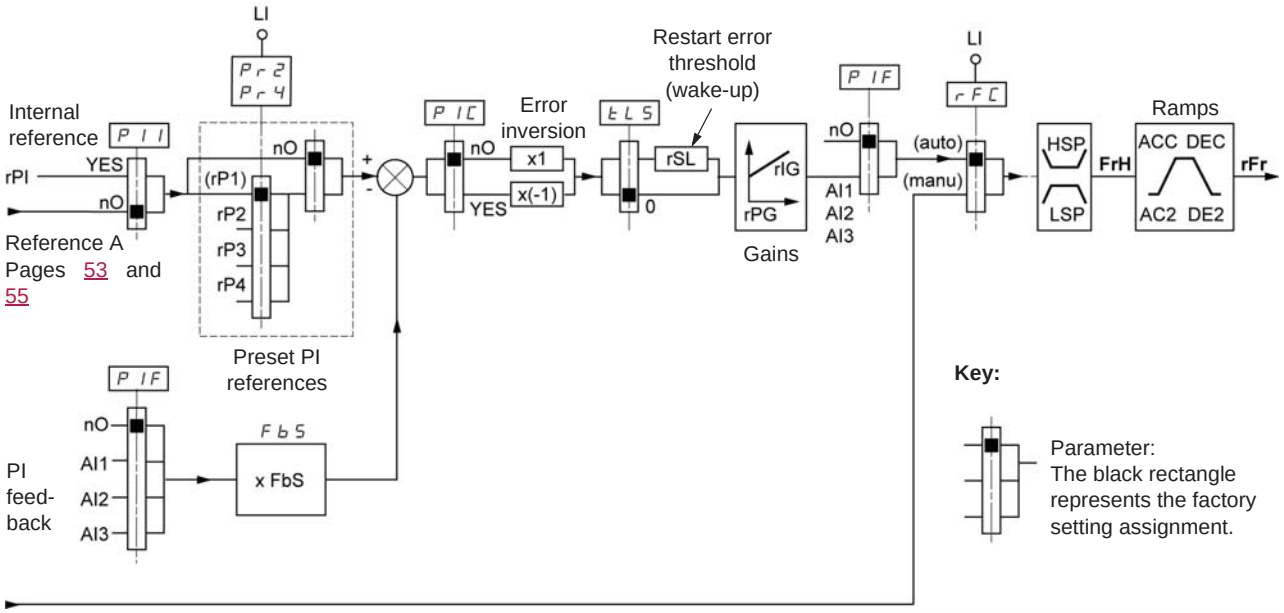
Code	Name/Description	Adjustment range	Factory setting
uPd-	**[+/- SPEED]** **(motorized jog dial)** Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), and [+/-spd HMI] (UPdH) or [+/- SPEED] (UPdt) selected, page 58. **Note:** The "+/- speed" function is incompatible with several functions (see page 21). It can only be configured if these functions are unassigned, in particular the summing inputs (set [Summing ref. 2] (SA2) to [No] (nO), page 70) and the preset speeds (set [2 preset speeds] (PS2) and [4 preset speeds] (PS4) to [No] (nO), page 72) which will have been assigned as part of the factory settings.		
uSP ★ nO LI1 LI2 LI3 LI4 LI5 LI6	**[+ speed assignment]** Parameter accessible for [+/- SPEED] (UPdt) only. Selecting the assigned logic input activates the function. ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6		[No] (nO)
dSP ★ nO LI1 LI2 LI3 LI4 LI5 LI6	**[-Speed assignment]** Parameter accessible for [+/- SPEED] (UPdt) only. Selecting the assigned logic input activates the function. ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6		[No] (nO)
Str ★ nO rAn EEP	**[Reference saved]** Associated with the "+/- speed" function, this parameter can be used to save the reference: • When the run commands disappear (saved to RAM) • When the line supply or the run commands disappear (saved to EEPROM) Therefore, the next time the drive starts up, the speed reference is the last reference saved. ☐ [No] (nO): No saving ☐ [RAM] (rAM): Saving in RAM ☐ [EEprom] (EEP): Saving in EEPROM		[No] (nO)

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

PI regulator

Block diagram

The function is activated by assigning an analog input to the PI feedback (measurement).



Reference B
Pages 53 and 55

PI feedback:

PI feedback must be assigned to one of these analog inputs, AI1, AI2, or AI3.

PI reference:

The PI reference can be assigned to the following parameters in order of priority:

- Preset references via logic inputs, [Preset ref. PID 2] (rP2), [Preset ref. PID 3] (rP3), and [Preset ref. PID 4] (rP4), page 81
- Internal reference [Internal PID ref.] (rPI), page 82
- Reference [Ref.1 channel] (Fr1), page 58

Combination table for preset PI references

LI (Pr4)	LI (Pr2)	Pr2 = nO	Reference
			rPI or Fr1
0	0		rPI or Fr1
0	1		rP2
1	0		rP3
1	1		rP4

Parameters can also be accessed in the [SETTINGS] (SEt-) menu:

- [Internal PID ref.] (rPI), page 32
- [Preset ref. PID 2] (rP2), [Preset ref. PID 3] (rP3), and [Preset ref. PID 4] (rP4), page 36
- [PID prop. gain] (rPG), page 36
- [PID integral gain] (rIG), page 36
- [PID fbk scale factor] (FbS), page 36:
  The [PID fbk scale factor] (FbS) parameter can be used to scale the reference according to the variation range for PI feedback (sensor rating).
  Example: Regulating pressure
  PI reference (process) 0-5 bar (0-100%)
  Rating of pressure sensor 0-10 bar
  [PID fbk scale factor] (FbS) = max. sensor scaling/max. process
  [PID fbk scale factor] (FbS) = 10/5= 2
- [PID wake up thresh.] (rSL), page 38:
  Can be used to set the PI error threshold above which the PI regulator will be reactivated (wake-up) after a stop due to the max. time threshold being exceeded at low speed [Low speed time out] (tLS)
- [PID correct. reverse] (PIC), page 36: If [PID correct. reverse] (PIC) = [No] (nO), the speed of the motor will increase when the error is positive (example: pressure control with a compressor). If [PID correct. reverse] (PIC) = [Yes] (YES), the speed of the motor will decrease when the error is positive (example: temperature control using a cooling fan).

"Manual - Automatic" operation with PI

This function combines the PI regulator and [Ref. 2 switching] (rFC) reference switching, page 59. The speed reference is given by [Ref.2 channel] (Fr2) or by the PI function, depending on the state of the logic input.

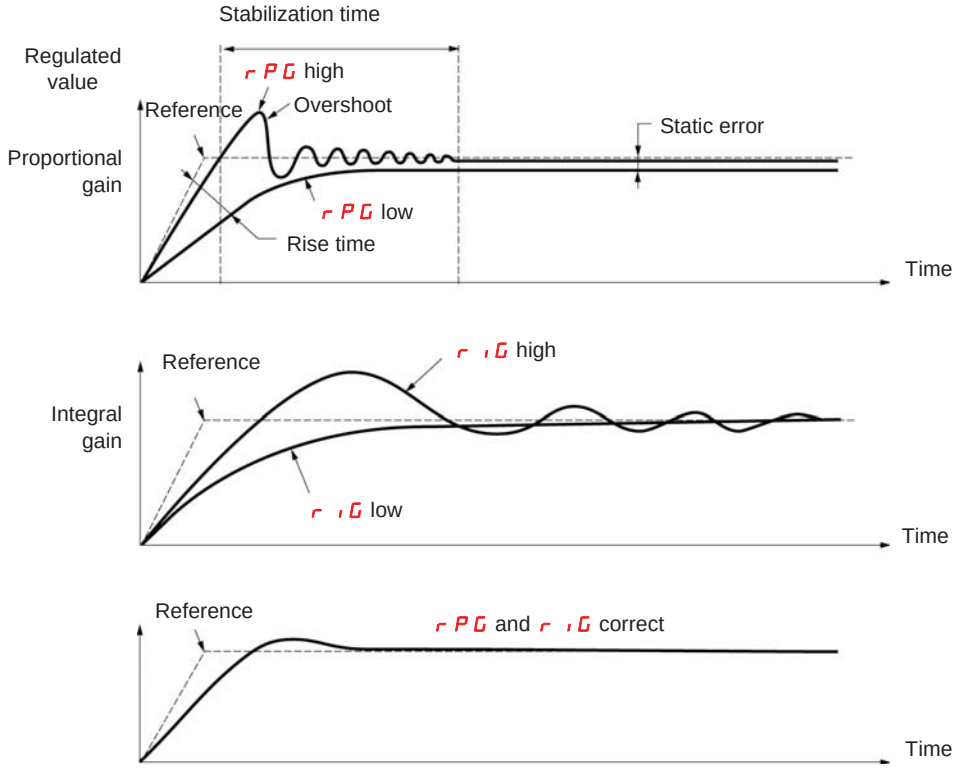
Setting up the PI regulator

1. **Configuration in PI mode**
   See the block diagram on page 78.
2. **Perform a test in factory settings mode (in most cases, this will be sufficient)**.
   To optimize the drive, adjust [PID prop. gain.] (rPG) or [PID integral gain] (rIG) gradually and independently, and observe the effect on the PI feedback in relation to the reference.
3. **If the factory settings are unstable or the reference is incorrect:**

Perform a test with a speed reference in manual mode (without PI regulator) and with the drive on load for the speed range of the system:
- In steady state, the speed must be stable and comply with the reference, and the PI feedback signal must be stable.
- In transient state, the speed must follow the ramp and stabilize quickly, and the PI feedback must follow the speed.

If this is not the case, see the settings for the drive and/or sensor signal and cabling.

Switch to PI mode.
Set [Dec ramp adapt.] (brA) to no (no auto-adaptation of the ramp).
Set the [Acceleration] (ACC) and [Deceleration] (dEC) speed ramps to the minimum level permitted by the mechanics without triggering an [OVERBRAKING] (ObF) fault.
Set the integral gain [PID integral gain] (rIG) to the minimum level.
Observe the PI feedback and the reference.
Switch the drive ON/OFF repeatedly or quickly vary the load or reference a number of times.
Set the proportional gain [PID prop. gain] (rPG) in order to ascertain a good compromise between response time and stability in transient phases (slight overshoot and 1 to 2 oscillations before stabilizing).
If the reference varies from the preset value in steady state, gradually increase the integral gain [PID integral gain] (rIG), reduce the proportional gain [PID prop. gain] (rPG) in the event of instability (pump applications), and find a compromise between response time and static precision (see diagram).
Perform in-production tests over the whole reference range.



The oscillation frequency depends on the system dynamics.

Parameter	Rise time	Overshoot	Stabilization time	Static error
[PID prop. gain] (rPG) ↗	↘↘	↗	=	↘
[PID integral gain] (rIG) ↗	↘	↗↗	↗	↘↘

Code	Name/Description	Adjustment range	Factory setting
PI-	**[PI REGULATOR]** **Note:** The "PI regulator" function is incompatible with several functions (see page 21). It can only be configured if these functions are unassigned, in particular the summing inputs (set [Summing ref. 2] (SA2) to [No] (nO), page 70) and the preset speeds (set [2 preset speeds] (PS2) and [4 preset speeds] (PS4) to [No] (nO), page 72) which will have been assigned as part of the factory settings.		
PIF	**[PID feedback ass.]** ☐ [No] (nO): Not assigned ☐ [AI1] (AI1): Analog input AI1 ☐ [AI2] (AI2): Analog input AI2 ☐ [AI3] (AI3): Analog input AI3		[No] (nO)
rPG ★	**[PID prop. gain]** (1) Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. It provides dynamic performance when PI feedback is changing quickly.	0.01 to 100	1
rIG ★	**[PID integral gain]** (1) Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. It provides static precision when PI feedback is changing slowly.	0.01 to 100	1
FbS ★	**[PID fbk scale factor]** (1) Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. For adapting the process.	0.1 to 100	1
PIC ★	**[PID correct. reverse]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. ☐ [No] (nO): Normal ☐ [Yes] (YES): Reverse		[No] (nO)
Pr2 ★	**[2 preset PID ref.]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. Selecting the assigned logic input activates the function. ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network		[No] (nO)

(1) Parameter(s) can also be accessed in the [SETTINGS] (SEt-) menu.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description		Adjustment range	Factory setting
PI-	**[PI REGULATOR]** (continued)			
Pr4 ★	**[4 preset PID ref.]** Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80. Selecting the assigned logic input activates the function. Make sure that [2 preset PID ref.] (Pr2), page 80, has been assigned before assigning [4 preset PID ref.] (Pr4). ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network			[No] (nO)
rP2 ★	**[Preset ref. PID 2]** See page 36.	(1)	0 to 100%	30%
rP3 ★	**[Preset ref. PID 3]** See page 36.	(1)	0 to 100%	60%
rP4 ★	**[Preset ref. PID 4]** See page 36.	(1)	0 to 100%	90%

(1) Parameter(s) can also be accessed in the [SETTINGS] (SEt-) menu.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
PI-	**[PI REGULATOR]** (continued)		
rSL	❏ **[PID wake up thresh.]** (1)	0 to 100%	0%

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Check that unintended restarts will not present any danger.

Failure to follow these instructions will result in death or serious injury.

★ If the "PI" and "Low speed operating time" [Low speed time out] (tLS) (page 38) are configured at the same time, the PI regulator may attempt to set a speed lower than[Low speed] (LSP).
This results in unsatisfactory operation, which consists of starting, operating at [Low speed] (LSP), then stopping, and so on.
The rSL (restart error threshold) parameter can be used to set a minimum PI error threshold for restarting after a stop at prolonged [Low speed] (LSP).
The function is inactive if [Low speed time out] (tLS) = 0.

PII	❏ **[Act. internal PID ref.]**	[No] (nO)

★

nO

YES

☐ [No] (nO): The reference for the PI regulator is [Ref.1 channel] (Fr1), except for [+/-spd HMI] (UPdH) and [+/- SPEED] (UPdt) (+/- speed cannot be used as a reference for the PI regulator).
☐ [Yes] (YES): The reference for the PI regulator is provided internally via the [Internal PID ref.] (rPI) parameter.

rPI	❏ **[Internal PID ref.]** (1)	0 to 100%	0%

★ Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80.

(1) Parameter(s) can also be accessed in the [SETTINGS] (SEt-) menu.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

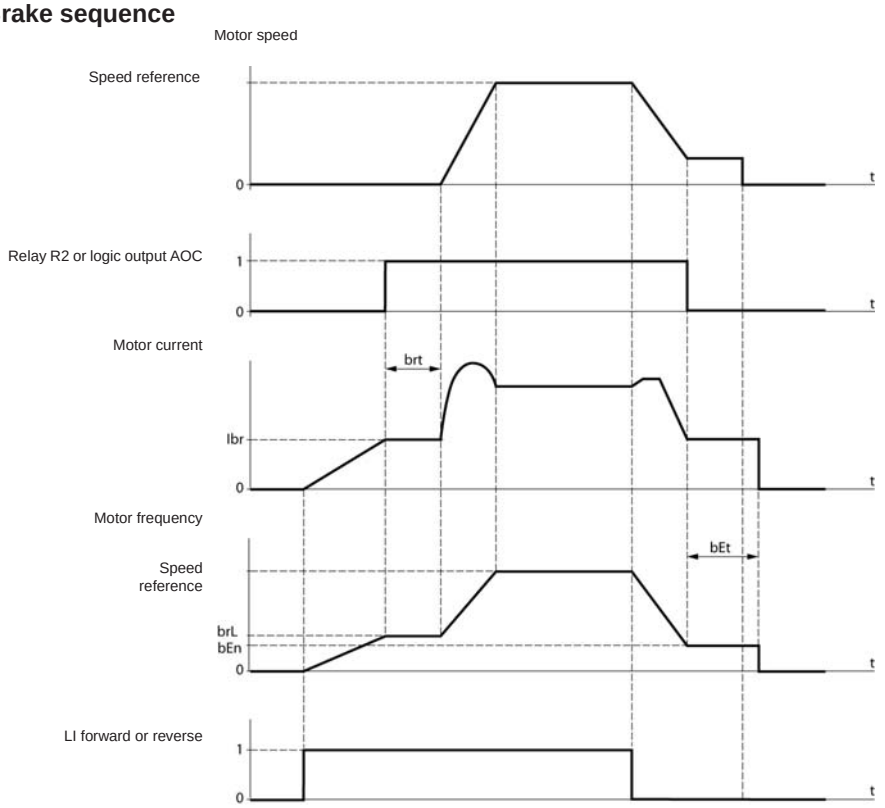
Brake control

Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3) (page 53).
This function, which can be assigned to relay R2 or logic output AOC, enables the drive to manage an electromagnetic brake.

Principle

Synchronize brake release with the build-up of torque during startup and brake engage at zero speed on stopping, to help prevent jolting.

Brake sequence



State of brake	Engaged	Released	Engaged

Settings which can be accessed in the application functions [APPLICATION FUNCT.] (FUn-) menu:

- Brake release frequency [Brake release freq] (brL)
- Brake release current [Brake release I FW] (Ibr)
- Brake release time delay [Brake Release time] (brt)
- Brake engage frequency [Brake engage freq] (bEn)
- Brake engage time delay [Brake engage time] (bEt)
- Brake release pulse [Brake impulse] (bIP)

Recommended brake control settings:

1. [Brake release freq] (brL), page 84:
   - Horizontal movement: Set to 0.
   - Vertical movement: Set to a frequency equal to the nominal motor slip in Hz.

2. [Brake release I FW] (Ibr), page 84:
   - Horizontal movement: Set to 0.
   - Vertical movement: Preset the nominal current of the motor then adjust it in order to help prevent jolting on start-up, making sure that the maximum load is held when the brake is released.

3. [Brake Release time] (brt), page 84:
   Adjust according to the type of brake. It is the time required for the mechanical brake to release.

4. [Brake engage freq] (bEn), page 84:
   - Horizontal movement: Set to 0.
   - Vertical movement: Set to a frequency equal to the nominal motor slip in Hz. **Note:** Max. [Brake engage freq] (bEn) **=** [Low speed] (LSP)**; this means an appropriate value must be set in advance for** [Low speed] (LSP).

5. [Brake engage time] (bEt), page 85:
   Adjust according to the type of brake. It is the time required for the mechanical brake to engage.

6. [Brake impulse] (bIP), page 85:
   - Horizontal movement: Set to [No] (nO).
   - Vertical movement: Set to [Yes] (YES) and check that the motor torque direction for "run forward" control corresponds to the upward direction of the load. If necessary, reverse two motor phases. This parameter generates motor torque in an upward direction regardless of the direction of operation commanded in order to maintain the load whilst the brake is releasing.

rEF-
SEt-
drC-
I-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Name/Description	Adjustment range	Factory setting
bLC-	**[BRAKE LOGIC CONTROL]** Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), page 58. **Note:** This function may be incompatible with other functions (see page 21).		
bLC nO r2 dO	**❑ [Brake assignment]** ☐ [No] (nO): Not assigned ☐ [R2] (r2): Relay R2 ☐ [DO] (dO): Logic output AOC If [Brake assignment] (bLC) is assigned, the [Catch on the fly] (FLr) parameter, page 93, and the [Dec ramp adapt.] (brA) parameter, page 64, are forced to [No] (nO), and the [Output Phase Loss] (OPL) parameter, page 94, is forced to [Yes] (YES). [Brake assignment] (bLC) is forced to [No] (nO) if [Output Phase Loss] (OPL) = [Output cut] (OAC), page 94.		[No] (nO)
brL ★	**❑ [Brake release freq]** Brake release frequency.	0.0 to 10.0 Hz	In accordance with the drive rating
Ibr ★	**❑ [Brake release I FW]** Brake release current threshold for ascending or forward movement. If the value of the current [brake release I FW] (Ibr) is lower than that the fluxing current of the motor, an output phase disconnection may not be detected before releasing the brake and the load may drop. **⚠ WARNING** **UNEXPECTED EQUIPMENT OPERATION** In applications involving vertical movement, the value of the current [brake release I FW] (Ibr) must be set above the value of the fluxing current of the motor. If this condition is not satisfied, a drive with encoder feedback must be used. **Failure to follow these instructions can result in death, serious injury, or equipment damage.** The fluxing current of a motor is equal to In * Square (1 - Cos² φ) with Cos φ indicated on the nameplate of the motor.	0 to 1.36 In (1)	In accordance with the drive rating
brt ★	**❑ [Brake Release time]** Brake release time delay.	0 to 5 s	0.5 s
LSP ★	**❑ [Low speed]** Motor frequency at min. reference. This parameter can also be changed in the [SETTINGS] (SEt-) menu, page 33.	0 to HSP (page 33)	0 LSP
bEn ★ nO 0 to LSP	**❑ [Brake engage freq]** ☐ Not set ☐ Adjustment range in Hz If [Brake assignment] (bLC) is assigned and [Brake engage freq] (bEn) remains set to [No] (nO), the drive will lock in [BRAKE CONTROL FAULT] (bLF) mode on the first run command.	nO - 0 to LSP	[No] (nO)

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
bLC-	**[BRAKE LOGIC CONTROL]** (continued)		
bEt ★	**[Brake engage time]** Brake engage time (brake response time).	0 to 5 s	0.5 s
b iP	**[Brake impulse]** ☐ [No] (nO): Whilst the brake is releasing, the motor torque direction corresponds to the direction of rotation commanded. ☐ [Yes] (YES): Whilst the brake is releasing, the motor torque direction is forward, regardless of the direction of operation commanded. **Note:** Check that the motor torque direction for "run forward" control corresponds to the upward direction of the load. If necessary, reverse two motor phases.		[No] (nO)
nO			
YES ★			

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

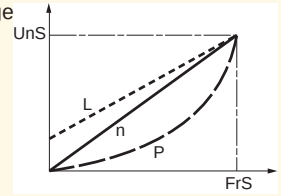
Code	Name/Description	Adjustment range	Factory setting
LC2-	**[CURRENT LIMITATION 2]** Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), page 58.		
LC2	**❑ [Current limit 2]** Selecting the assigned logic input activates the function. ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network [Current Limitation] (CLI) is enabled when the logic input or control word bit is at state 0 ([SETTINGS] (SEt-) menu, page 38). [I Limit. 2 value] (CL2) is enabled when the logic input or control word bit is at state 1.		[No] (nO)
CL2 ★	**❑ [I Limit. 2 value]** (1) See page 38.	0.25 to 1.5 In (2)	1.5 In (2)

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
CHP-	**[SWITCHING MOTOR]** Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), page 58.		
CHP	**[Motor switching]** ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible: ☐ [CD11] (CD11): Bit 11 of the control word from a communication network ☐ [CD12] (CD12): Bit 12 of the control word from a communication network ☐ [CD13] (CD13): Bit 13 of the control word from a communication network ☐ [CD14] (CD14): Bit 14 of the control word from a communication network ☐ [CD15] (CD15): Bit 15 of the control word from a communication network LI or bit = 0: Motor 1 LI or bit = 1: Motor 2 **Note:** • If this function is used, the auto-tuning function, page 43, is not active on motor 2. • Changes to parameters are only taken into account when the drive is locked. **CAUTION** **RISK OF DAMAGE TO MOTOR** The motor switching function disables motor thermal protection. The use of external overload protection is required when using motor switching. **Failure to follow these instructions can result in equipment damage.**		[No] (nO)
UnS2 ★	**[Nom. mot. 2 volt.]** ATV312●●●M2: 100 to 240 V ATV312●●●M3: 100 to 240 V ATV312●●●N4: 100 to 500 V ATV312●●●S6: 100 to 600 V	In accordance with the drive rating	In accordance with the drive rating
FrS2 ★	**[Nom. motor 2 freq.]** **Note:** The ratio $\frac{\text{[Rated motor volt.] (UnS) (in volts)}}{\text{[Rated motor freq.] (FrS) (in Hz)}}$ must not exceed the following values: ATV312●●●M2: 7 max. ATV312●●●M3: 7 max. ATV312●●●N4: 14 max. ATV312●●●S6: 17 max. The factory setting is 50 Hz, or preset to 60 Hz if [Standard mot. freq] (bFr) is set to 60 Hz.	10 to 500 Hz	50 Hz

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
CHP-	**[SWITCHING MOTOR]** (continued)		
nCr2 ★	❑ **[Nom. mot. 2 current]** Nominal motor 2 current given on the rating plate.	0.25 to 1.5 In (2)	In accordance with the drive rating
nSP2 ★	❑ **[Nom. mot. 2 speed]** 0 to 9,999 rpm then 10.00 to 32.76 krpm If, rather than the nominal speed, the nameplate indicates the synchronous speed and the slip in Hz or as a %, calculate the nominal speed as follows: • Nominal speed = synchronous speed x $\frac{100 - \text{slip as a \%}}{100}$ or • Nominal speed = synchronous speed x $\frac{50 - \text{slip in Hz}}{50}$ (50 Hz motors) or • Nominal speed = synchronous speed x $\frac{60 - \text{slip in Hz}}{60}$ (60 Hz motors)	0 to 32,760 rpm	In accordance with the drive rating
CoS2 ★	❑ **[Motor 2 Cosinus Phi]** Cos Phi given on the rating plate of motor 2.	0.5 to 1	In accordance with the drive rating
UFt2 L P n nLd ★	❑ **[U/F mot.2 selected]** ☐ [Cst. torque] (L): Constant torque for motors connected in parallel or special motors ☐ [Var. torque] (P): Variable torque for pump and fan applications ☐ [SVC] (n): Sensorless flux vector control for constant torque applications ☐ [Energy sav.] (nLd): Energy saving, for variable torque applications not requiring high dynamics (behaves in a similar way to the P ratio at no load and the n ratio on load) Voltage  Frequency		[SVC] (n)
UFr2 ★	❑ **[IR compensation 2]** (1) See page 39.	0 to 100%	20%
FLG2 ★	❑ **[FreqLoopGain 2]** (1) See page 39.	1 to 100%	20%
StA2 ★	❑ **[Freq. loop stability 2]** (1) See page 39.	1 to 100%	20%
SLP2 ★	❑ **[Slip compensation 2]** (1) See page 39.	0 to 150%	100%

(1) Parameter can also be accessed in the [SETTINGS] (SEt-) menu.
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Management of limit switches

Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), page 58.
This function can be used to manage the operation of one or two series limit switches (non-reversing or reversing).

- Assignment of one or two logic inputs (forward limit switch, reverse limit switch)
- Selection of the stop type (on ramp, fast or freewheel)
  Following a stop, the motor is permitted to restart in the opposite direction only.
- The stop is performed when the input is in state 0. The direction of operation is authorized in state 1.

Restarting after stop caused by a limit switch

- Send a run command in the other direction (when control is via the terminals, if [2/3 wire control] (tCC) = [2 wire] (2C) and [2 wire type] (tCt) = [Transition] (trn), first remove all the run commands).

or

- Invert the reference sign, remove all the run commands then send a run command in the same direction as before the stop caused by a limit switch.

Code	Name/Description	Adjustment range	Factory setting
LSt-	**[LIMIT SWITCHES]** Function can only be accessed if [ACCESS LEVEL] (LAC) = [Level 2] (L2) or [Level 3] (L3), page 58. **Note:** This function is incompatible with the "PI regulator" function (see page 21).		
LAF	**[Stop FW limit sw.]**		[No] (nO)
nO	☐ [No] (nO): Not assigned		
LI1	☐ [LI1] (LI1): Logic input LI1		
LI2	☐ [LI2] (LI2): Logic input LI2		
LI3	☐ [LI3] (LI3): Logic input LI3		
LI4	☐ [LI4] (LI4): Logic input LI4		
LI5	☐ [LI5] (LI5): Logic input LI5		
LI6	☐ [LI6] (LI6): Logic input LI6		
LAr ★	**[Stop RV limit sw.]**		[No] (nO)
nO	☐ [No] (nO): Not assigned		
LI1	☐ [LI1] (LI1): Logic input LI1		
LI2	☐ [LI2] (LI2): Logic input LI2		
LI3	☐ [LI3] (LI3): Logic input LI3		
LI4	☐ [LI4] (LI4): Logic input LI4		
LI5	☐ [LI5] (LI5): Logic input LI5		
LI6	☐ [LI6] (LI6): Logic input LI6		
LAS ★	**[Stop type]** Parameter can be accessed if [Stop FW limit sw.] (LAF), page 89, or [Stop RV limit sw.] (LAr), page 89, is assigned.		[Freewheel] (nSt)
rMP	☐ [Ramp stop] (rMP): On ramp		
FSt	☐ [Fast stop] (FSt): Fast stop		
nSt	☐ [Freewheel] (nSt): Freewheel stop		

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[APPLICATION FUNCT.] (FUn-) menu

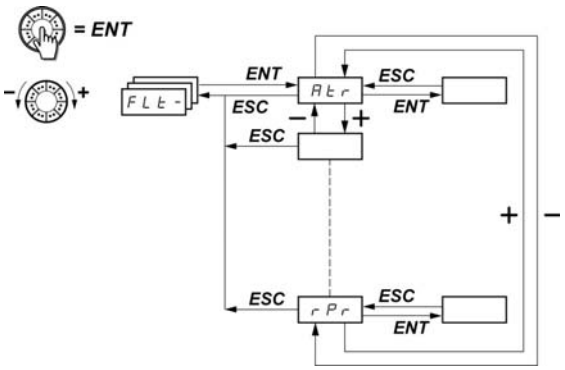
rEF-
SEt-
drC-
I-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Name/Description	Adjustment range	Factory setting
ArE	❏ **[Select ATV31 conf.]** This parameter is invisible if a communication option is present. It is only used to transfer a configuration via a loader tool or an ATV31 remote terminal. [Select ATV31 conf.] (ArE) can be used during a transfer between an ATV31 and ATV312 to specify the type of ATV31 (ATV31 or ATV31●●●●●●A). See page 105 **Configuration transfer between an ATV31 and an ATV312** for more details about compatible loader tools. Note : The transfer can't be done from an ATV31 to an ATV312 with a communication option board		[No] (nO)
nO	☐ [No] (nO): Transfer between two ATV312 **Note1**: PC Software is only compatible with ATV312 using the standard input/output control board. **Note2**: Transfer between 2 drives is only possible if they have the same communication board.		
31E	☐ [ATV31 std] (31E): Transfer from an ATV31 to an ATV312. Set ARE = 31E to download a configuration from a European ATV31.		
31A	☐ [ATV31...A] (31A): Transfer from an ATV31●●●●●●A to an ATV312. Set ARE = 31A to download a configuration from an Asian ATV31. Procedure for transferring a configuration: • Set [Select ATV31 conf.] (ArE) to the required value. • Perform the configuration transfer. • Once the transfer is complete, turn the drive off. • Power the drive up again to initialize the configuration. • The parameter is restored to its factory setting.		
SCS 2 s	❏ **[Saving config.]** See page 45.	(1)	[No] (nO)
CFG 2 s	❏ **[Macro configuration]** See page 45.	(1)	[Factory set.] (Std)
FCS 2 s	❏ **[Restore config.]** See page 46.	(1)	[No] (nO)

(1) [Saving config.] (SCS), [Macro configuration] (CFG), and [Restore config.] (FCS) can be accessed from several configuration menus, but they apply to all menus and parameters.

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

[FAULT MANAGEMENT] (FLt-) menu



Automatic restart

Operating time reset to zero

The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote display terminal, this menu can be accessed with the switch in the position.

Code	Description	Adjustment range	Factory setting
Atr	❑ [Automatic restart]		[No] (nO)

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- The automatic restart can only be used on machines or installations which do not pose any danger to either personnel or equipment.
- If the automatic restart is activated, R1 will only indicate a fault has been detected once the time-out period for the restart sequence has expired.
- The equipment must be used in compliance with national and regional safety regulations.

Failure to follow these instructions will result in death or serious injury.

The motor's automatic restart function will only be active in 2-wire level control ([2/3 wire control] (tCC) = [2 wire] (2C), and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO)).

nO ☐ [No] (nO): Function inactive

YES ☐ [Yes] (YES): Automatic restart if the fault has been cleared and the other operating conditions permit the restart. The restart is performed by a series of automatic attempts separated by increasingly longer waiting periods: 1 s, 5 s, 10 s, then 1 min for subsequent ones.
If the restart has not taken place once the [Max. restart time] (tAr) configurable time has elapsed, the procedure is aborted and the drive remains locked until it is turned off and then on again.
This function is possible with the following conditions:
[NETWORK FAULT] (CnF): Communication detected fault on the communication card
[CANopen com.] (COF): CANopen communication detected fault
[External] (EPF): External fault
[4-20mA] (LFF): 4-20 mA loss
[Overbraking] (ObF): DC bus overvoltage
[Drive overheat] (OHF): Drive overheating
[Motor overload] (OLF): Motor overload
[Mot. phase] (OPF): Motor phase loss
[Mains overvoltage] (OSF): Line supply overvoltage
[Mains phase loss] (PHF): Line phase loss
[MODBUS FAULT] (SLF): Modbus communication

Relay R1 remains activated if this function is active. The speed reference and the operating direction must be maintained.

[FAULT MANAGEMENT] (FLt-) menu

rEF-
SEt-
drC-
I-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Description	Adjustment range	Factory setting
tAr ★ 5 10 30 1h 2h 3h Ct	❏ **[Max. restart time]** Parameter is only visible if [Automatic restart] (Atr) = [Yes] (YES). It can be used to limit the number of consecutive restarts in the event of a recurrent detected fault. ☐ [5 min] (5): 5 minutes ☐ [10 min] (10): 10 minutes ☐ [30 min] (30): 30 minutes ☐ [1 hour] (1h): 1 hour ☐ [2 hours] (2h): 2 hours ☐ [3 hours] (3h): 3 hours ☐ [Unlimited] (Ct): Unlimited (except for [MOTOR PHASE LOSS] (OPF) and [INPUT PHASE LOSS] (PHF); the max. duration of the restart process is limited to 3 hours)		[5 min] (5)
rSF nO LI1 LI2 LI3 LI4 LI5 LI6	❏ **[Fault reset]** ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6		[No] (nO)

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[FAULT MANAGEMENT] (FLt-) menu

Code	Description	Adjustment range	Factory setting
FLr	❏ **[Catch on the fly]**		[No] (nO)
	Used to enable a smooth restart if the run command is maintained after the following events: - Loss of line supply or simple power off - Reset of current drive or automatic restart - Freewheel stop The speed given by the drive resumes from the estimated speed of the motor at the time of the restart, then follows the ramp to the reference speed. This function requires 2-wire control ([2/3 wire control] (tCC) = [2 wire] (2C)) with [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO).		
nO	☐ [No] (nO): Function inactive		
YES	☐ [Yes] (YES): Function active When the function is operational, it activates at each run command, resulting in a slight delay (1 second max.). [Catch on the fly] (FLr) is forced to [No] (nO) if brake control [Brake assignment] (bLC) is assigned, page 84.		
EtF	❏ **[External fault ass.]**		[No] (nO)
nO	☐ [No] (nO): Not assigned		
LI1	☐ [LI1] (LI1): Logic input LI1		
LI2	☐ [LI2] (LI2): Logic input LI2		
LI3	☐ [LI3] (LI3): Logic input LI3		
LI4	☐ [LI4] (LI4): Logic input LI4		
LI5	☐ [LI5] (LI5): Logic input LI5		
LI6	☐ [LI6] (LI6): Logic input LI6		
	If [ACCESS LEVEL] (LAC) = [Level 3] (L3), the following assignments are possible:		
CD11	☐ [CD11] (CD11): Bit 11 of the control word from a communication network		
CD12	☐ [CD12] (CD12): Bit 12 of the control word from a communication network		
CD13	☐ [CD13] (CD13): Bit 13 of the control word from a communication network		
CD14	☐ [CD14] (CD14): Bit 14 of the control word from a communication network		
CD15	☐ [CD15] (CD15): Bit 15 of the control word from a communication network		
LEt	❏ **[External fault config]**		[Active high] (HIG)
Lo	☐ [Active low] (LO): The external fault is detected when the logic input assigned to [External fault ass.] (EtF) changes to state 0. **Note:** In this case, [External fault ass.] (EtF) cannot be assigned to a control word bit from a communication network.		
HIG	☐ [Active high] (HIG): The external fault is detected when the logic input or the bit assigned to [External fault ass.] (EtF) changes to state 1. **Note:** Where [External fault config] (LEt) = [Active high] (HIG), [External fault ass.] (EtF) is assigned to a control word bit from a communication network, and where there is no [External fault ass.] (EtF) fault detection, switching to [External fault config] (LEt) = [Active low] (LO) triggers [External fault ass.] (EtF) fault detection. In this case, it is necessary to turn the drive off and then back on again.		
EPL	❏ **[External fault mgt]**		[Freewheel] (YES)
nO	☐ [Ignore] (nO): Ignore		
YES	☐ [Freewheel] (YES): Detected fault management with freewheel stop		
rnP	☐ [Ramp stop] (rMP): Detected fault management with stop on ramp		
FSt	☐ [Fast stop] (FSt): Detected fault management with fast stop		

Code	Description	Adjustment range	Factory setting
oPL	❏ [Output Phase Loss]		[Yes] (YES)

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

If **[Output Phase Loss] (OPL)** is set to **nO** loss of cable is not detected
- Check this action will not endanger personnel or equipment in any way

Failure to follow these instructions will result in death or serious injury.

- nO ☐ [No] (nO): Function inactive
- YES ☐ [Yes] (YES): Tripping on the [MOTOR PHASE LOSS] (OPF)
- oAC ☐ [Output cut] (OAC): No tripping on a [MOTOR PHASE LOSS] (OPF), but management of the output voltage in order to avoid an overcurrent when the link with the motor is re-established and catch on the fly performed even if [Catch on the fly] (FLr) = [No] (nO). To be used with output contactor.
  [Output Phase Loss] (OPL) is forced to [Yes] (YES) if [Brake assignment] (bLC) is not set to [No] (nO), page 84.

iPL	❏ [Input phase loss]		[Yes] (YES)

This parameter is only accessible on 3-phase drives.
- nO ☐ [No] (nO): Ignore
- YES ☐ [Yes] (YES): Stop mode when fault detected: freewheel

oHL	❏ [Overtemp fault mgt]		[Freewheel] (YES)

CAUTION

RISK OF DAMAGE TO THE MOTOR

Inhibiting drive overheating fault detection results in the drive not being protected. This invalidates the warranty.
- Check that the possible consequences do not present any risk.

Failure to follow these instructions can result in equipment damage.

- nO ☐ [Ignore] (nO): Ignore
- YES ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- rnP ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- FSt ☐ [Fast stop] (FSt): Detected fault management with fast stop

oLL	❏ [Overload fault mgt]		[Freewheel] (YES)

CAUTION

RISK OF DAMAGE TO THE MOTOR

If **[Overload fault mgt]** is set to **nO**, motor thermal protection is no longuer provided by the drive. Provide an alternative means of thermal protection.

Failure to follow these instructions can result in equipment damage.

- nO ☐ [Ignore] (nO): Ignore
- YES ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- rnP ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- FSt ☐ [Fast stop] (FSt): Detected fault management with fast stop

Code	Description	Adjustment range	Factory setting
SLL	❏ **[Modbus fault mgt]**		[Freewheel] (YES)

⚠ WARNING

LOSS OF CONTROL

If **[Modbus fault mgt] (SLL)** = **[Ignore] (n0)**, communication control will be inhibited. For safety reasons, inhibiting the communication fault detection should be restricted to the debug phase or to special applications.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

nO YES rnP FSt
- ☐ [Ignore] (nO): Ignore
- ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- ☐ [Fast stop] (FSt): Detected fault management with fast stop

This parameter does not apply to PC-Software.

CoL	❏ **[CANopen fault mgt]**		[Freewheel] (YES)

⚠ WARNING

LOSS OF CONTROL

If **[CANopen fault mgt] (COL)** = **[Ignore] (n0)**, communication control will be inhibited. For safety reasons, inhibiting the communication fault detection should be restricted to the debug phase or to special applications.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

nO YES rnP FSt
- ☐ [Ignore] (nO): Ignore
- ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- ☐ [Fast stop] (FSt): Detected fault management with fast stop

tnL	❏ **[Autotune fault mgt]**		[Yes] (YES)

This parameter can be used to manage drive behavior in the event that auto-tuning is unsuccessful [AUTO TUNING FAULT] (tnF)

nO YES
- ☐ [No] (nO): Ignored (the drive reverts to the factory settings)
- ☐ [Yes] (YES): Detected fault management with drive locked

If [Cold stator resist.] (rSC), page 42, is not set to [No] (nO), [Autotune fault mgt] (tnL) is forced to [Yes] (YES).

LFL	❏ **[4-20mA loss]**		[Freewheel] (YES)

nO YES LFF rLS rnP FSt
- ☐ [Ignore] (nO): Ignored (only possible value if [AI3 min. value] (CrL3) ⩽ 3 mA, page 48)
- ☐ [Freewheel] (YES): Detected fault management with freewheel stop
- ☐ [fallback spd] (LFF): The drive switches to the fallback speed ([fallback spd] (LFF) parameter).
- ☐ [Spd maint.] (rLS): The drive maintains the speed at which it was operating when the loss was detected. This speed is saved and stored as a reference until the fault has disappeared.
- ☐ [Ramp stop] (rMP): Detected fault management with stop on ramp
- ☐ [Fast stop] (FSt): Detected fault management with fast stop

Note: Before setting [4-20mA loss] (LFL) to [fallback spd] (LFF) check the connection of input AI3.
If [4-20mA loss] (LFL) = [fallback spd] (LFF) or [Spd maint.] (rLS), no code is displayed.

LFF	❏ **[Fallback speed]**	0 to 500 Hz	10 Hz

Fallback speed setting in the event of a [4-20mA loss] (LFL).

[FAULT MANAGEMENT] (FLt-) menu

rEF-
SEt-
drC-
i-O-
CtL-
Fun-
FLt-
CoM-
SuP-

Code	Description	Adjustment range	Factory setting
drn	❑ **[Derated operation]**		[No] (nO)
	Lowers the tripping threshold of [Undervoltage] (USF): in order to operate on line supplies with 50% voltage drops.		
2 s	☐ [No] (nO): Function inactive ☐ [Yes] (YES): Function active In this case, drive performance is derated.		
no YES	**CAUTION** **RISK OF DAMAGE TO DRIVE** When **[Derated operation] (drn)** = **[Yes] (YES)**, use a line choke (see catalog). **Failure to follow these instructions can result in equipment damage.**		
StP	❑ **[UnderV. prevention]**		[No] (nO)
	This function can be used to control the type of stop where there is a loss of line supply.		
no nnS rMP FSt	☐ [No] (nO): Locking of the drive and freewheel stopping of the motor ☐ [DC Maintain] (MMS): This stop mode uses the inertia to maintain the drive power supply as long as possible. ☐ [Ramp stop] (rMP): Stop according to the valid ramp ([Deceleration] (dEC) or [Deceleration 2] (dE2)) ☐ [Fast stop] (FSt): Fast stop, the stopping time depends on the inertia and the braking ability of the drive.		
inH	❑ **[Fault inhibit assign.]**		[No] (nO)
	DANGER **LOSS OF PERSONNEL AND EQUIPMENT PROTECTION** • Enabling the fault inhibition parameter **[Fault inhibit assign.] (inH)** will disable the drive controller protection features. • InH should not be enabled for typical applications of this equipment. • InH should be enabled only in extraordinary situations where a thorough risk analysis demonstrates that the presence of adjustable speed drive protection poses a greater risk than personnel injury or equipment damage. **Failure to follow these instructions will result in death or serious injury.**		
2 s	This function disables drive protection for the following detected faults: SLF, CnF, EPF, CrF, LFF, OHF, OBF, OLF, OSF, OPF, PHF, SOF, tnF, COF, bLF		
no LI1 LI2 LI3 LI4 LI5 LI6	☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 The logic inputs are active in the high state.		

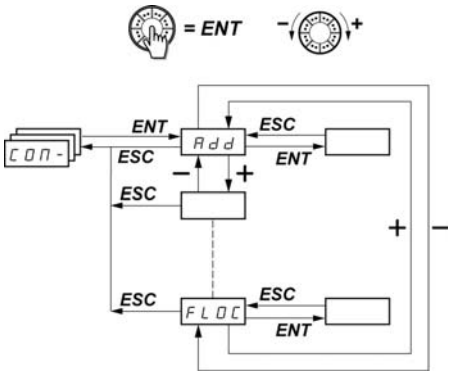
2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

Code	Description	Adjustment range	Factory setting
rPr nO rtH	❏ [Operating t. reset] ☐ [No] (nO): No ☐ [rst. runtime] (rtH): Operating time reset to zero The [Operating t. reset] (rPr) parameter automatically returns to [No] (nO) after resetting to 0.		[No] (nO)
rP 2 s nO YES	❏ [Product reset] **⚠ DANGER** **UNINTENDED EQUIPMENT OPERATION** You are going to reset the drive. • Check this action will not endanger personnel or equipment in any way. **Failure to follow these instructions will result in death or serious injury.** ☐ [No] (nO): No ☐ [Yes] (YES): Yes		[No] (nO)

2 s The jog dial (ENT) needs to be pressed and held down (for 2 s) to change the assignment for this parameter.

[COMMUNICATION] (COM-) menu

rEF-
SEt-
drC-
I-O-
CtL-
Fun-
FLt-
CoM-
SuP-



The parameters can only be modified when the drive is stopped and no run command is present. Modifications to the [Modbus Address] (Add), [Modbus baud rate] (tbr), [Modbus format] (tFO), [CANopen address] (AdCO), and [CANopen bit rate] (bdCO) parameters are not taken into account until the drive has been switched off and back on again.
On the optional ATV31 remote display terminal, this menu can be accessed with the switch in the position.

Code	Description	Adjustment range	Factory setting
Add	❑ [Modbus Address] Modbus address for the drive.	1 to 247	1
tbr	❑ [Modbus baud rate] Modbus transmission speed		19,200 bps
4.8	☐ [4.8 Kbps] (4.8): 4,800 bits/second		
9.6	☐ [9.6 Kbps] (9.6): 9,600 bits/second		
19.2	☐ [19.2 Kbps] (19.2): 19,200 bits/second (**Note:** This is the only value which supports the use of the remote display terminal.)		
tFo	❑ [Modbus format]		[8-E-1] (8E1)
8o1	☐ [8-O-1] (8O1): 8 data bits, odd parity, 1 stop bit		
8E1	☐ [8-E-1] (8E1): 8 data bits, even parity, 1 stop bit (**Note:** This is the only value which supports the use of the remote display terminal.)		
8n1	☐ [8-N-1] (8n2): 8 data bits, no parity, 1 stop bit		
8n2	☐ [8-N-2] (8n2): 8 data bits, no parity, 2 stop bits		
tto	❑ [Modbus time out]	0.1 to 30 s	10 s
AdCo	❑ [CANopen address] CANopen address for the drive.	0 to 127	0
bdCo	❑ [CANopen bit rate] Modbus transmission speed		125 bps
10.0	☐ [10 kbps] (10.0): 10 kbps		
20.0	☐ [20 kbps] (20.0): 20 kbps		
50.0	☐ [50 kbps] (50.0): 50 kbps		
125.0	☐ [125 kbps] (125.0): 125 kbps		
250.0	☐ [250 kbps] (250.0): 250 kbps		
500.0	☐ [500 kbps] (500.0): 500 kbps		
1000	☐ [1 Mbps] (1000): 1000 kbps		
ErCo	❑ [Error code]		-
0	☐ No error		
1	☐ Bus off		
2	☐ Life time		
3	☐ CAN overrun		
4	☐ Heartbeat		

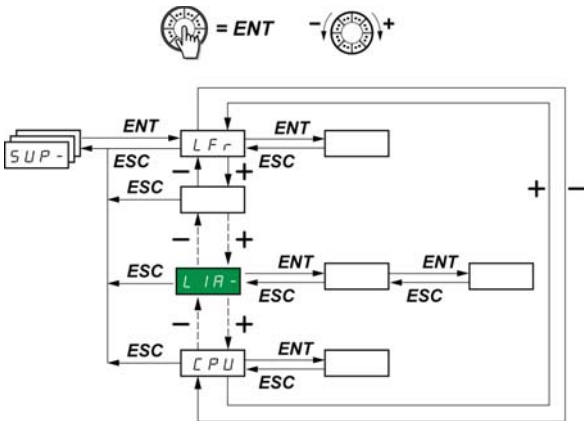
[COMMUNICATION] (COM-) menu

Code	Description	Adjustment range	Factory setting
FLo nO LI1 LI2 LI3 LI4 LI5 LI6	❏ **[Forced local assign.]** ☐ [No] (nO): Not assigned ☐ [LI1] (LI1): Logic input LI1 ☐ [LI2] (LI2): Logic input LI2 ☐ [LI3] (LI3): Logic input LI3 ☐ [LI4] (LI4): Logic input LI4 ☐ [LI5] (LI5): Logic input LI5 ☐ [LI6] (LI6): Logic input LI6 In forced local mode, the terminals and the display terminal regain control of the drive.		[No] (nO)
FLoC ★ AI1 AI2 AI3 AIV1 LCC	❏ **[Forced local Ref.]** Parameter can only be accessed if [ACCESS LEVEL] (LAC) = [Level 3] (L3), page 58. In forced local mode, only the speed reference is taken into account. PI functions, summing inputs, etc. are not active. See the diagrams on pages 55 to 57. ☐ [AI1] (AI1): Analog input AI1, logic inputs LI ☐ [AI2] (AI2): Analog input AI2, logic inputs LI ☐ [AI3] (AI3): Analog input AI3, logic inputs LI ☐ [AI Virtual 1] (AIV1): Jog dial, RUN/STOP buttons ☐ [HMI] (HMI): Remote display terminal: [HMI Frequency ref.] (LFr) reference, page 32, RUN/STOP/FWD/REV buttons		[AI1] (AI1)

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[MONITORING] (SUP-) menu

rEF-
SEt-
drC-
i-O-
CtL-
Fun-
FLt-
CoM-
SuP-



Submenu

The parameters can be accessed with the drive running or stopped.
On the optional remote display terminal, this menu can be accessed with the switch in any position.

Some functions have numerous parameters. In order to clarify programming and avoid having to scroll through endless parameters, these functions have been grouped in submenus.
Like menus, submenus are identified by a dash after their code: L iA- for example.

When the drive is running, the value displayed is that of one of the monitoring parameters. By default, the value displayed is the output frequency applied to the motor ([Output frequency] (rFr) parameter).
While the value of the new monitoring parameter required is being displayed, press and hold down the jog dial (ENT) again (for 2 seconds) to confirm the change of monitoring parameter and store it. From then on, it is the value of this parameter that will be displayed during operation (even after powering down).
"Unless the new choice is confirmed by pressing and holding down ENT again, the display will revert to the previous parameter after powering down.

Note: After the drive has been turned off or following a loss of line supply, the parameter displayed is the drive status ([Ready] (rdY), for example).
The selected parameter is displayed following a run command.

[MONITORING] (SUP-) menu

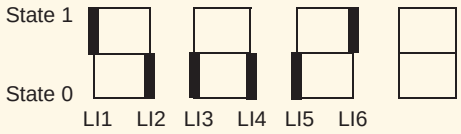
Code	Description	Variation range
LFr ★	❑ **[HMI Frequency ref.]** Frequency reference for control via built-in display terminal or remote display terminal.	0 to 500 Hz
rP1 ★	❑ **[Internal PID ref.]** Internal PID reference Parameter is only visible if [PID feedback ass.] (PIF) is not set to [No] (nO), page 80.	0 to 100%
FrH	❑ **[Frequency ref.]** Frequency reference before ramp (absolute value).	0 to 500 Hz
rFr	❑ **[Output frequency]** This parameter is also used for the +/- speed function using the jog dial on the keypad or display terminal. It displays and validates operation (see page 58). In the event of a loss of line supply, [Output frequency] (rFr) is not stored and the +/- speed function must be re-enabled in [MONITORING] (SUP-) and [Output frequency] (rFr).	- 500 Hz to + 500 Hz
SPd1 or SPd2 or SPd3	❑ **[Cust. output value]** [Cust. output value] (SPd1), [Cust. output value] (SPd2) or [Cust. output value] (SPd3) depending on the [Scale factor display] (SdS) parameter, page 40 ([Cust. output value] (SPd3) in the factory setting)	
LCr	❑ **[Motor current]** Estimation of current in the motor	
oPr	❑ **[Motor power]** 100% = nominal motor power, calculated using the parameters entered in the [MOTOR CONTROL] (drC-) menu	
uLn	❑ **[Mains voltage]** This parameter gives the line voltage via the DC bus, both in motor mode or when the motor is stopped.	
tHr	❑ **[Motor thermal state]** 100% = nominal thermal state 118% = "OLF" threshold (drive overload)	
tHd	❑ **[Drv. Therm att.]** 100% = nominal thermal state 118% = "OHF" threshold (drive overheating)	

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and set from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Description	Variation range
LFt	❑ [Last fault occurred] ☐ [Brake control] (bLF): Brake control detected fault ☐ [Incorrect config.] (CFF): Incorrect configuration (parameters) ☐ [Invalid config.] (CFI): Invalid configuration (parameters) ☐ [NETWORK FAULT] (CnF): Communication detected fault on the communication card ☐ [CANopen com.] (COF): Communication detected fault line 2 (CANopen) ☐ [Capa.charg] (CrF): Capacitor precharge detected fault ☐ [EEPROM] (EEF): EEPROM memory detected fault ☐ [External] (EPF): External fault ☐ [internal com. link] (ILF): Option internal link detected fault ☐ [INTERNAL FAULT] (IF1): Unknown rating ☐ [INTERNAL FAULT] (IF2): HMI card not recognized or incompatible/display absent ☐ [INTERNAL FAULT] (IF3): EEPROM detected fault ☐ [INTERNAL FAULT] (IF4): Industrial EEPROM detected fault ☐ [4-20mA] (LFF): 4-20 mA loss ☐ [No fault] (nOF): No fault code saved ☐ [Overbraking] (ObF): DC bus overvoltage ☐ [Overcurrent] (OCF): Overcurrent ☐ [Drive overheat] (OHF): Drive overheating ☐ [Motor overload] (OLF): Motor overload ☐ [Mot. phase] (OPF): Motor phase loss ☐ [Mains overvoltage] (OSF): Line supply overvoltage ☐ [Mains phase loss] (PHF): Line phase loss ☐ [Mot. short circuit] (SCF): Motor short-circuit (phase, ground) ☐ [Modbus] (SLF): Modbus communication detected fault ☐ [Overspeed] (SOF): Motor overspeed ☐ [Auto-tuning] (tnF): Auto-tuning detected fault ☐ [Undervoltage] (USF): Line supply undervoltage	
otr	❑ [Motor torque] 100% = nominal motor torque, calculated using the parameters entered in the [MOTOR CONTROL] (drC-) menu.	
rtH	❑ [Run time] Total time the motor has been powered up: 0 to 9,999 (hours), then 10.00 to 65.53 (kilo-hours). Can be reset to zero by the [Operating t. reset] (rPr) parameter in the [FAULT MANAGEMENT] (FLt-) menu, page 97.	0 to 65,530 hours

[MONITORING] (SUP-) menu

Code	Description	Variation range
CoD	**❑ [PIN code 1]** Enables the drive configuration to be protected using an access code. When access is locked by means of a code, only the parameters in the [MONITORING] (SUP-) and [SPEED REFERENCE] (rEF-) menus can be accessed. The MODE button can be used to switch between menus. **Note: Before entering a code, do not forget to make a careful note of it.**	
OFF	☐ [OFF] (OFF): No access locking codes • To lock access, enter a code (2 to 9,999). The display can be incremented using the jog dial. Then press ENT. [ON] (On) appears on the screen to indicate that access has been locked.	
on	☐ [ON] (On): A code is locking access (2 to 9,999). • **To unlock access**, enter the code (incrementing the display using the jog dial) and press ENT. The code remains on the display and access is unlocked until the next time the drive is turned off. Access will be locked again the next time the drive is turned on. • **If an incorrect code is entered**, the display changes to [ON] (On), and access remains locked.	
8888	☐ Access is unlocked (the code remains on the screen). • **To reactivate locking with the same code** when access has been unlocked, return to [ON] (On) using the jog dial and then press ENT. [ON] (On) remains on the screen to indicate that access has been locked. • **To lock access with a new code** when access has been unlocked, enter the new code (increment the display using the jog dial) and then press ENT. On appears on the screen to indicate that access has been locked. • **To clear locking** when access has been unlocked, return to [OFF] (OFF) using the jog dial and then press ENT. [OFF] (OFF) remains on the display. Access is unlocked and will remain so until the next restart.	
tuS	**❑ [Auto tuning state]**	
tAb	☐ [Not done] (tAb): The default stator resistance value is used to control the motor.	
PEnd	☐ [Pending] (PEnd): Auto-tuning has been requested but not yet performed.	
PrOG	☐ [In Progress] (PrOG): Auto-tuning in progress.	
FAIL	☐ [Failed] (FAIL): Auto-tuning was unsuccessful.	
donE	☐ [Done] (dOnE): The stator resistance measured by the auto-tuning function is used to control the motor.	
Strd	☐ [Entered R1] (Strd): The cold state stator resistance ([Cold stator resist.] (rSC) which is not set to [No] (nO)) is used to control the motor.	
CuS	☐ [Customized] (CUS): The value of [Cold stator resist.] (rSC), page 43 is set manually.	
udP	**❑ [Drv.Soft.Ver]** This parameter gives the software version for the drive. Example: 1102 = V1.1 IE02	
oICt	**❑ [OPT1 card type]** This parameter is only visible if an option card is present. It is used to visualize the name of the option currently present.	
no	No card, CANopen card or DaisyChain card (these cards are unable to send their names to the ATV312)	
dnt	DeviceNet card	
PbS	Profibus card	
CnF	**❑ [Network fault]** Option card fault code This parameter is read-only and is only visible if an option card is present. The fault code remains saved in the parameter, even if the cause disappears. The parameter is reset after the drive is disconnected and then reconnected. The values of this parameter depend on the network card. Consult the manual for the corresponding card.	

Code	Name/Description	Adjustment range	Factory setting
LIA-	**[LOGIC INPUT CONF.]**		
LI1A LI2A LI3A LI4A LI5A LI6A	Can be used to display the functions assigned to each input. If no functions have been assigned, [No] (nO) is displayed. The jog dial can be used to scroll through all the functions. If a number of functions have been assigned to the same input, check that they are compatible.		
LIS	Can be used to display the state of logic inputs (display segment assignment: high = 1, low = 0)  Example above: LI1 and LI6 are at 1; LI2 to LI5 are at 0.		
AIA-	**[ANALOG INPUTS IMAGE]**		
AI1A AI2A AI3A	Can be used to display the functions assigned to each input. If no functions have been assigned, [No] (nO) is displayed. The jog dial can be used to scroll through all the functions. If a number of functions have been assigned to the same input, check that they are compatible.		

Migration ATV31 - ATV312

The ATV312 is compatible with the ATV31.
To retrieve the configuration of the ATV31, simply transfer the configuration from the ATV31 to the ATV312. See below **Configuration transfer between an ATV31 and an ATV312**

Dimensions

For all sizes, the ATV312 is 6 mm less deep than the ATV31●●●●●●A.

Replacing an ATV31●●●●●●A with an ATV312

Note: Position of the logic input switch
On the ATV31●●●●●●A, the logic input switch was set to "**Sink**" in the factory setting.
On the ATV312, it is set to "**Source**" in the factory setting.
Set the switch to match the setting on the product being replaced. For more information, see the "Control terminals" chapter in the Installation Manual.

Note: Position of the IT jumper
There was no integrated EMC filter on the ATV31●●●●●●A. For details on how to deactivate the integrated EMC filter on the ATV312, see the "Operation with IT connection" chapter in the Installation Manual.

ATV312 used in LOCAL configuration (see page 27) uses the Jog Dial as a potentiometer and RUN button is activated. This is a similar way of working than ATV31●●●●●●A. When the drive is powered up for the first time, the two parameters shown below appear after [Standard mot. freq] (bFr). They need to be set as follows:
[Ref.1 channel] (Fr1), page 29, to [AI Virtual 1] (AIV1)
[2/3 wire control] (tCC), page 30, to [Local] (LOC)

The following parameters can be used subsequently to return to the other HMI version:
[Ref.1 channel] (Fr1) in the [COMMAND] (CtL-) menu
[2/3 wire control] (tCC) in the [INPUTS / OUTPUTS CFG] (I-O-) menu

Factory settings
As well as the differences in terms of control by potentiometer, the following differences apply between the factory settings for the ATV31●●●●●●A and those of the ATV312:

Parameter	ATV31●●●●●●A	ATV312
[2/3 wire control] (tCC)	Local control LOC	[2 wire] (2C)
[Ref.1 channel] (Fr1)	Analog input AIP	AI1
[Cmd channel 1] (Cd1)	Local control LOC	tEr
[Reverse assign.] (rrS)	[No] (nO) (if [2/3 wire control] (tCC) = [Local] (LOC))	LI2
[Forced local Ref.] (FLOC)	AIP jog dial	AIU1
[Select ATV31 conf.] (ArE)	Parameter does not exist on the ATV31	[No] (nO)

Configuration transfer between an ATV31 and an ATV312 (using the ATV31 remote terminal or a loader tool)

Compatible loader tools are :
- Multi-Loader V1.10 and higher,
- Simple-Loader V1.3 and higher,
- SoMove V1.1.11.1 and higher,
- SoMove Mobile V2.0 and higher,
- PC software.

Note: The transfer can't be done from an ATV31 to an ATV312 with a communication option board.

A new [Select ATV31 conf.] (ArE) parameter has been added to the [APPLICATION FUNCT.] (FUn-) menu.
It can be used to specify the ATV31 type (ATV31 or ATV31●●●●●●A) during transfers between an ATV31 and ATV312.

Values of the [Select ATV31 conf.] (ArE) parameter:
- [No] (nO), factory setting, transfer between two ATV312
- [ATV31...A] (31A), transfer from ATV31●●●●●●A to ATV312
- [ATV31 std] (31E), transfer from ATV31 to ATV312

To perform a configuration transfer, see the procedure on page 90.

Drive does not start, no code displayed

- If the display does not light up, check the power supply to the drive and check the wiring of inputs AI1 and AI2 and the connection to the RJ45 connector.
- The assignment of the "Fast stop" or "Freewheel stop" functions will prevent the drive from starting if the corresponding logic inputs are not powered up. The ATV312 then displays [Freewheel stop] (nSt) or [Fast stop] (FSt). This is normal since these functions are active at zero so that the drive will be stopped if there is a wire break.
- Check that the run command input(s) have been actuated in accordance with the chosen control mode (the [2/3 wire control] (tCC) parameter in the [INPUTS / OUTPUTS CFG] (I-O-) menu, page 47).
- If an input is assigned to the limit switch function and this input is at zero, the drive can only be started up by sending a command for the opposite direction (see page 89).
- If the reference channel (page 53) or the control channel (page 54) is assigned to a communication network, when the power supply is connected, the drive will display [Freewheel stop] (nSt) and remain in stop mode until the communication bus sends a command.
- If the LED on the DC bus is lit and nothing appears on the display, check that there is no short-circuit on the 10 V power supply.
- If the drive displays [Ready] (rdy) and refuses to start, check that there is no short-circuit on the 10 V power supply and check the wiring of inputs AI1 and AI2 and the connection to the RJ45 connector.
- In the factory setting, the "RUN" button is inactive. Set the [Ref.1 channel] (Fr1) parameter, page 29 , and the [Cmd channel 1] (Cd1) parameter, page 59, to control the drive locally.

Fault detection codes which require a power reset after the fault is cleared

The cause of the fault must be removed before resetting by cycling power to the drive.
[PRECHARGE FAULT] (CrF), [OVERSPEED] (SOF), [AUTO-TUNING FAULT] (tnF), and [BRAKE CONTROL FAULT] (bLF) can also be reset remotely using a logic input (the [Fault reset] (rSF) parameter in the [FAULT MANAGEMENT] (FLt-) menu, page 92).

Code	Name	Probable cause	Remedy
bLF	[BRAKE CONTROL FAULT]	• Brake release current not reached • Brake engage frequency threshold [Brake engage freq] (bEn) = [No] (nO) (not set) whereas the brake control [Brake assignment] (bLC) is assigned • Loss of one phase at drive output • Output contactor open	• Check the drive/motor connection. • Check the motor windings. • Check the [Brake release I FW] (Ibr) setting in the [APPLICATION FUNCT.] (FUn-) menu, page 84. • Apply the recommended settings for [Brake engage freq] (bEn), pages 83 and 84.
CrF	[PRECHARGE FAULT]	• Precharge relay control or damaged precharge resistor	• Replace the drive.
EEF	[EEPROM FAULT]	• Internal memory	• Check the environment (electromagnetic compatibility) • Replace the drive.
iF1	[INTERNAL FAULT]	• Unknown rating	• Replace the drive. • Restart the drive. • Contact a Schneider Electric representative.
iF2	[INTERNAL FAULT]	• HMI card not recognized • HMI card incompatible • No display present	
iF3	[INTERNAL FAULT]	• EEPROM	
iF4	[INTERNAL FAULT]	• Industrial EEPROM	

Fault detection codes which require a power reset after the fault is cleared (continued)

Code	Name	Probable cause	Remedy
oCF oAF oCF	[OVERCURRENT]	• Parameters in the [SETTINGS] (SEt-) and [MOTOR CONTROL] (drC-) menus are incorrect. • Inertia or load too high • Mechanical locking • Phase/Ground Motor short-circuit • Impedant short-circuit	• Check the parameters in [SETTINGS] (SEt-), page 32, and [MOTOR CONTROL] (drC-) page 41 • Check the size of the motor/drive/load • Check the state of the mechanism
SCF	[MOTOR SHORT CIRCUIT]	• Short-circuit at the drive output • Significant ground leakage current at the drive output if several motors are connected in parallel • Grounding at the drive output	• Check the cables connecting the drive to the motor, and the motor insulation. • Reduce the switching frequency • Connect chokes in series with the motor
SoF	[OVERSPEED]	• Instability or • Driving load too high	• Check the motor, gain and stability parameters • Add a braking resistor • Check the size of the motor/drive/load

Fault detection codes that can be reset with the automatic restart function after the cause has disappeared

See the [Automatic restart] (Atr) function, page 91.
These detected faults can also be reset by turning the drive off then on again or by means of a logic input (the [Fault reset] (rSF) parameter, page 92, in the [FAULT MANAGEMENT] (FLt-) menu, page 91).

Code	Name	Probable cause	Remedy
CnF	[NETWORK FAULT]	• Communication detected fault on the communication card	• Check the environment (electromagnetic compatibility) • Check the wiring. • Check the time out. • Replace the option card. • See the [CANopen fault mgt] (COL) parameter page 95 to define the stop mode with a (CnF).
CoF	[CANopen FAULT]	• Interruption in communication on the CANopen bus	• Check the communication bus • Refer to the relevant product documentation.
EPF	[EXTERNAL FAULT]	• Depending on user	• Depending on user
iLF	[INTERNAL LINK FAULT]	• Identification detected fault of the communication card by the drive	• Check that the option card is compatible with the drive • Replace the option card.
LFF	[4-20mA LOSS]	• Loss of the 4-20 mA reference on input AI3	• Check the connection on input AI3.
obF	[OVERBRAKING]	• Braking too sudden or driving load	• Increase the deceleration time • Install a braking resistor if necessary. • Activate the [Dec ramp adapt.] (bra) function, page 64, if it is compatible with the application.
oHF	[DRIVE OVERHEAT]	• Drive temperature too high	• Check the motor load, the drive ventilation and the environment. Wait for the drive to cool before restarting.

Fault detection codes that can be reset with the automatic restart function after the cause has disappeared (continued)

Code	Name	Probable cause	Remedy
oLF	[MOTOR OVERLOAD]	• Triggered by excessive motor current • [Cold stator resist.] (rSC) parameter value incorrect	• Check the [Mot. therm. current] (ItH) setting, page 33, of the motor thermal protection, check the motor load. Wait for the drive to cool before restarting. • Remeasure [Cold stator resist.] (rSC), page 42.
oPF	[MOTOR PHASE LOSS]	• Loss of one phase at drive output • Output contactor open • Motor not connected or motor power too low • Instantaneous instability in the motor current	• Check the connections from the drive to the motor. • If an output contactor is being used, set [Output Phase Loss] (OPL) to [Output cut] (OAC) ([FAULT MANAGEMENT] (FLt-) menu, page 94). • Test on a low-power motor or without a motor: In factory settings mode, motor output phase loss detection is active ([Output Phase Loss] (OPL) = [Yes] (YES)). To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high-power drives), deactivate motor phase loss detection ([Output Phase Loss] (OPL) = [No] (nO)). • Check and optimize the [IR compensation] (UFr), [Rated motor volt.] (UnS), and [Rated mot. current] (nCr) parameters, and perform an [Auto tuning] (tUn) operation, page 43.
oSF	[MAINS OVERVOLTAGE]	• Line voltage is too high. • Disturbed line supply	• Check the line voltage.
PHF	[INPUT PHASE LOSS]	• Drive incorrectly supplied or a fuse blown • Failure of one phase • Three-phase ATV312 used on a single-phase line supply • Unbalanced load This protection only operates with the drive on load	• Check the power connection and the fuses. • Reset • Use a three-phase line supply. • Disable the detection by setting [Input phase loss] (IPL) = [No] (nO) ([FAULT MANAGEMENT] (FLt-) menu, page 94).
SLF	[MODBUS FAULT]	• Interruption in communication on the Modbus bus • Remote display terminal enabled ([HMI command] (LCC) = [Yes] (YES), page 61) and terminal disconnected.	• Check the communication bus • Refer to the relevant product documentation. • Check the link with the remote display terminal.
tnF	[AUTO TUNING FAULT]	• Special motor or motor whose power is not suitable for the drive • Motor not connected to the drive	• Use the L ratio or the [Var. torque] (P) ratio (see [U/F mot 1 selected] (UFt), page 44). • Check that the motor is present during auto-tuning. • If an output contactor is being used, close it during auto-tuning.

Fault detection codes that are reset as soon as their cause disappears

Code	Name	Probable cause	Remedy
CFF	[INCORRECT CONFIG.]	• The current configuration is inconsistent. • Addition or removal of an option	• Return to factory settings or retrieve the backup configuration, if it is valid. See the [Restore config.] (FCS) parameter, page 46.
CFI	[INVALID CONFIG]	• Invalid configuration The configuration loaded in the drive via the serial link is inconsistent	• Check the configuration loaded previously. • Load a consistent configuration.
USF	[UNDERVOLTAGE]	• Insufficient line supply • Transient voltage dip • Damaged precharge resistor	• Check the voltage and the voltage parameter. Tripping threshold in [UNDERVOLTAGE] (USF) ATV312●●●●M2: 160 V ATV312●●●●M3: 160 V ATV312●●●●N4: 300 V ATV312●●●●S6: 430 V • Replace the drive.

Fault detection codes displayed on the ATV12 remote display terminal

Code	Name	Description
init	Initialization in progress	• The microcontroller is initializing. • Search underway for communication configuration
CoM.E (1)	Communication error	• Time out detected fault (50 ms) • This message is displayed after 20 attempts at communication.
A-17 (1)	Alarm button	• A button has been held down for more than 10 seconds. • The keypad is disconnected. • The "keypad" wakes up when a button is pressed.
clr (1)	Confirmation of detected fault reset	• This is displayed when the STOP button is pressed once during a remote terminal detected fault.
dEu.E (1)	Drive disparity	• The drive brand does not match that of the remote terminal.
roM.E (1)	ROM anomaly	• The remote terminal detects a ROM anomaly on the basis of checksum calculation.
rAM.E (1)	RAM anomaly	• The remote terminal detects a RAM anomaly.
CPu.E (1)	Other detected faults	• Other detected faults

(1) Flashing

Index of functions

[+/- SPEED]	76
[2/3 wire control]	47
[ACCESS LEVEL]	58
[Analog./logic output]	48
[Auto DC injection]	68
[Automatic restart]	91
[Auto tuning]	43
Brake control	83
[CANopen address]	98
[Catch on the fly]	93
[Cmd switching]	60
Control and reference channels	50
[Current limit 2]	86
[Current Limitation]	38
[DC injection assign.]	66
[Dec ramp adapt.]	64
Drive thermal protection	12
Drive ventilation	12
[Fast stop]	65
[Fault reset]	92
[Forced local assign.]	99
[Freewheel stop ass.]	67
[JOG]	75
Management of limit switches	89
[Modbus Address]	98
[Mot. therm. current]	33
Motor thermal protection	13
PI regulator	78
Preset speeds	71
[R1 Assignment]	49
[R2 Assignment]	49
[RAMPS]	62
[Ramp switch ass.]	64
[Ref. 2 switching]	59
Return to factory settings/Restore configuration	46
Saving the configuration	45
[Skip Frequency]	36
[STOP MODES](continued)	65
[SUMMING INPUTS]	70
[Switching freq.]	40
[SWITCHING MOTOR]	87
[U/F mot 1 selected]	44

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
AC2	32 64	[Acceleration 2]	s	In accordance with inr	-	5	
ACC	32 63	[Acceleration]	s	In accordance with inr	-	3	
AdC	68	[Auto DC injection]	-	no YES Ct	[No]: No injection [Yes]: Standstill injection for adjustable period [Continuous]: Continuous standstill injection	YES	
AdCo	98	[CANopen address]	-	0 to 127	-	0	
Add	98	[Modbus Address]	-	1 to 247	-	1	
AI1A	104	[AI1 assignment]	-	-	-	-	
AI2A	104	[AI2 assignment]	-	-	-	-	
AI3A	104	[AI3 assignment]	-	-	-	-	
AIv1	31	[Image input AIV1]	%	0 to 100	-	-	
AO1t	48	[AO1 Type]	-	0A 4A 10u	[Current]: Configuration 0 - 20 mA [Cur. 4-20]: Configuration 4 - 20 mA [Voltage]: Configuration 0 - 10 V	0	
ArE	90	[Select ATV31 conf.]		no 31A 31E	[No]: Transfer between two ATV312 [ATV31...A]: Transfer from an ATV31●●●●●●A to an ATV312 [ATV31 std] : Transfer from an ATV31 to an ATV312	no	
Atr	91	[Automatic restart]	-	no YES	[No]: Function inactive [Yes]: Automatic restart	no	
bdCo	98	[CANopen bit rate]	kbps	10.0 20.0 50.0 125.0 250.0 500.0 1000	[10 kbps]: 10 kbps [20 kbps]: 20 kbps [50 kbps]: 50 kbps [125 kbps]: 125 kbps [250 kbps]: 250 kbps [500 kbps]: 500 kbps [1 Mbps]: 1000 kbps	125.0	
bEn	84	[Brake engage freq]	-	no 0 to LSP	Not set Adjustment range in Hz	no	
bEt	85	[Brake engage time]	s	0 to 5	-	0.5	
bFr	29 41	[Standard mot. freq]	Hz	50 60	[50Hz IEC] [60Hz NEMA]	50	
bIP	85	[Brake impulse]	-	no YES	[No]: Motor torque during brake release in the direction of rotation requested [Yes]: Motor torque during brake release in forward rotation	no	
bLC	84	[Brake assignment]	-	no r2 do	[No]: Not assigned [R2]: Relay R2 [DO]: Logic output AOC	no	
brA	64	[Dec ramp adapt.]	-	no YES	[No]: Function inactive [Yes]: Function active	YES	
brL	84	[Brake release freq]	Hz	0.0 to 10.0	-	In accordance with the drive rating	
brt	84	[Brake Release time]	s	0 to 5	-	0.5	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
CCS	60	[Cmd switching]	-	Cd1 Cd2 LI1 LI2 LI3 LI4 LI5 LI6 C111 C112 C113 C114 C115 C211 C212 C213 C214 C215	[ch1 active] : Control channel = channel 1 [ch2 active] : Control channel = channel 2 [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [C111]: Bit 11 of Modbus control word [C112]: Bit 12 of Modbus control word [C113]: Bit 13 of Modbus control word [C114]: Bit 14 of Modbus control word [C115]: Bit 15 of Modbus control word [C211]: Bit 11 of network control word [C212]: Bit 12 of network control word [C213]: Bit 13 of network control word [C214]: Bit 14 of network control word [C215]: Bit 15 of network control word	Cd1	
Cd1	59	[Cmd channel 1]	-	tEr LoC LCC ndb nEt	[Terminal]: Control via terminals [Local]: Control via keypad [Remot. HMI]: Control via remote display terminal [Modbus]: Control via Modbus [Network]: Control via the network	tEr	
Cd2	60	[Cmd channel 2]	-	tEr LoC LCC ndb nEt	[Terminal]: Control via terminals [Local]: Control via keypad [Remot. HMI]: Control via remote display terminal [Modbus]: Control via Modbus [Network]: Control via the network	Ndb	
CFG	45 49 61 90	[Macro configuration]	-	StS Std	[Start/Stop]: Start/stop configuration [Factory set.]: Factory configuration	Std	
CHCF	59	[Profile]	-	SIM SEP	[Not separ.]: Combined [Separate]: Separate	SIM	
CHP	87	[Motor switching]	-	no LI1 LI2 LI3 LI4 LI5 LI6 Cd11 Cd12 Cd13 Cd14 Cd15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	no	
CLI	38	[Current Limitation]	In	0.25 to 1.5	-	1.5	
CL2	38 86	[I Limit. 2 value]	In	0.25 to 1.5	-	1.5	
CnF	103	[Network fault]	-	-	-	-	
Cod	103	[PIN code 1]	-	OFF on 8888	[OFF]: No code is locking access [ON]: A code is locking access. Access is unlocked.	-	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
CoL	95	[CANopen fault mgt]	-	no YES rnP FSt	[Ignore]: Ignore [Freewheel]: Detected fault management with freewheel stop [Ramp stop]: Detected fault management with stop on ramp [Fast stop]: Detected fault management with fast stop	YES	
CoP	60	[Copy channel 1<>2]	-	no SP Cd ALL	[No]: No copy [Reference]: Copy reference [Command]: Copy command [Cmd + ref.] : Copy command and reference	no	
CoS	42	[Motor 1 Cosinus Phi]	-	0.5 to 1	-	In accordance with the drive rating	
CoS2	88	[Motor 2 Cosinus Phi]	-	0.5 to 1	-	In accordance with the drive rating	
CrH3	48	[AI3 max. value]	mA	4 to 20	-	20	
CrL3	48	[AI3 min. value]	mA	0 to 20	-	4	
Ctd	39	[Current threshold]	In	0 to 1.5	-	1	
dCF	65	[Differential current fault]	-	0 to 10	-	4	
dCI	66	[DC injection assign.]	-	no LI1 LI2 LI3 LI4 LI5 LI6 Cd11 Cd12 Cd13 Cd14 Cd15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	no	
dE2	32 64	[Deceleration 2]	s	In accordance with inr	-	5	
dEC	32 63	[[Deceleration]	s	In accordance with inr	-	3	
do	48	[Analog./logic output]	-	no oCr oFr otr oPr FLt run FtA FLA CtA SrA tSA bLC APL	[No]: Not assigned [I motor]: Motor current [Motor freq.]: Motor frequency [Motor torq.]: Motor torque [P. supplied]: Power supplied by the drive [Drive fault]: Detected fault. [Drv running]: Drive running [Freq. limit]: Frequency threshold reached [HSP limit]: High speed reached [Brake seq.]: Current threshold reached [Freq. ref.]: Frequency reference reached [Drv thermal]: Motor thermal threshold reached [Brake seq.]: Brake sequence [No 4-20mA]: Loss of 4-20 mA signal	no	
drn	96	[Derated operation]	-	no YES	[No]: Function inactive [Yes]: Function active	no	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
dSP	77	[-Speed assignment]	-	nO LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	nO	
EPL	93	[External fault mgt]	-	nO YES rnP FSt	[Ignore]: Ignore [Freewheel]: Detected fault management with freewheel stop [Ramp stop]]: Detected fault management with stop on ramp [Fast stop]: Detected fault management with fast stop	YES	
ErCo	98	[Error code]	-	0 1 2 3 4	No error Bus off Life time CAN overrun Heartbeat	-	
EtF	93	[External fault ass.]	-	nO LI1 LI2 LI3 LI4 LI5 LI6 Cd11 Cd12 Cd13 Cd14 Cd15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	nO	
FbS	36 80	[PID fbk scale factor]	-	0.1 to 100	-	1	
FCS	46 49 61 90	[Restore config.]	-	nO rECI inI	[NO]: Function inactive [Internal]: The current configuration becomes identical to the backup configuration previously saved by SCS = StrI. [Factory Set.]: Current configuration replaced by the CFG parameter.	nO	
FLG	33	[FreqLoopGain]	%	1 to 100	-	20	
FLG2	39 88	[FreqLoopGain 2]	%	1 to 100	-	20	
FLo	99	[Forced local assign.]	-	nO LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	nO	
FLoC	99	[Forced local Ref.]	-	AI1 AI2 AI3 AIU1 LCC	[AI1]: Analog input AI1, logic inputs LI [AI2]: Analog input AI2, logic inputs LI [AI3]: Analog input AI3, logic inputs LI [Network AI]: Jog dial, RUN/STOP buttons [HMI]: Remote display terminal, RUN/STOP/FWD/REV buttons	AI1	
FLr	93	[Catch on the fly]	-	nO YES	[No]: Function inactive [Yes]: Function active	nO	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
Fr1	29 58	[Ref.1 channel]	-	AI1 AI2 AI3 AIU1 UPdt UPdH LCC Mdb nEt	[AI1]: Analog input AI1 [AI2]: Analog input AI2 [AI3]: Analog input AI3 [Network AI]: Jog dial [+/-Speed]: +/- speed reference via LI [+/-spd HMI]: +/- speed reference using the jog dial on the ATV312 keypad [HMI]: Reference via the remote display terminal [Modbus]: Reference via Modbus [Network]: Reference via network	AI1	
Fr2	58	[Ref.2 channel]	-	no AI1 AI2 AI3 AIU1 UPdt UPdH LCC Mdb nEt	[No]: Not assigned [AI1]: Analog input AI1 [AI2]: Analog input AI2 [AI3]: Analog input AI3 [Network AI]: Jog dial [+/-Speed]: +/- speed reference via LI [+/-spd HMI]: +/- speed reference using the jog dial on the ATV312 keypad [HMI]: Reference via the remote display terminal [Modbus]: Reference via Modbus [Network]: Reference via network	no	
FrH	101	[Frequency ref.]	Hz	0 to 500	-	-	
FrS	41	[Rated motor freq.]	Hz	10 to 500	-	50	
FrS2	87	[Nom. motor 2 freq.]	Hz	10 to 500	-	50	
Frt	64	[Ramp 2 threshold]	Hz	0 to 500	-	0	
FSt	65	[Fast stop]	-	no LI1 LI2 LI3 LI4 LI5 LI6 Cd11 Cd12 Cd13 Cd14 Cd15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	no	
Ftd	39	[Freq. threshold]	Hz	0 to 500	-	bFr	
HSP	33	[High speed]	Hz	LSP to tFr	-	bFr	
Ibr	84	[Brake release I FW]	In	0 to 1.36	-	In accordance with the drive rating	
IdC	34 66	[DC inject. level 1]	In	0 to In	-	0.7	
InH	96	[Fault inhibit assign.]	-	no LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	no	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
inr	63	[Ramp increment]	-	0.01 0.1 1	[0.01]: Ramp can be set between 0.05 s and 327.6 s. [0.1]: Ramp can be set between 0.1 s and 3,276 s. [1]: Ramp can be set between 1 s and 32,760 s.	0.1	
IPL	94	[Input phase loss]	-	nO YES	[No]: Ignore [Yes]: Detected fault management with freewheel stop	YES	
ItH	33	[Mot. therm. current]	In	0.2 to 1.5	-	In accordance with the drive rating	
JF2	36	[Skip Frequency 2]	Hz	1 to 500	-	0	
JGF	36 75	[Jog frequency]	Hz	0 to 10	-	10	
JoG	75	[JOG]	-	nO LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	nO	
JPF	36	[Skip Frequency]	Hz	0 to 500	-	0	
LAC	58	[ACCESS LEVEL]	-	L1 L2 L3	[Level 1]: Access to standard functions [Level 2]: Access to advanced functions in the Fun- menu [Level 3]: Access to advanced functions and management of mixed control modes	L1	
LAF	89	[Stop FW limit sw.]	-	nO LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	nO	
LAr	89	[Stop RV limit sw.]	-	nO LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	nO	
LAS	89	[Stop type]	-	rMP FSt nSt	[Ramp stop]: On ramp [Fast stop]: Fast stop [Freewheel]: Freewheel stop	nSt	
LC2	86	[Current limit 2]	-	nO LI1 LI2 LI3 LI4 LI5 LI6 Cd11 Cd12 Cd13 Cd14 Cd15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	nO	
LCC	61	[HMI command]	-	nO YES	[No]: Function inactive [Yes]: Enables control of the drive using the STOP/RESET, RUN and FWD/REV buttons on the display terminal	nO	
LCr	101	[Motor current]	A	-	-	-	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
LEt	93	[External fault config]	-	LO HIG	[Active low]: The external fault is detected when the logic input assigned to EtF changes to state 0. [Active high]: The external fault is detected when the logic input or bit assigned to EtF changes to state 1.	HIG	
LFF	95	[Fallback speed]	Hz	0 to 500	-	10	
LFL	95	[4-20mA loss]	-	nO YES LFF rLS rnP FSt	[Ignore]: Ignore [Freewheel]: Detected fault management with freewheel stop [fallback spd]: The drive switches to the fallback speed. [Spd maint.]: The drive maintains the speed at which it was operating when the fault occurred. [Ramp stop]: Detected fault management with stop on ramp [Fast stop] : Detected fault management with fast stop	YES	
LFr	32 101	[HMI Frequency ref.]	-	0 to HSP	-	-	
LFt	102	[Last fault occurred]	-	bLF CFF CFI CnF CoF CrF EEF EPF IF1 IF2 IF3 IF4 LFF noF obF oCF oHF oLF oPF oSF PHF SCF SLF SoF tnF uSF	[Brake control]: Brake control detected fault [Incorrect config.]: Incorrect configuration [Invalid config.]: Invalid configuration [NETWORK FAULT]: Communication detected fault on the communication card [CANopen com.]: Communication detected fault line 2 (CANopen) [Capa.charg]: Capacitor precharge detected fault [EEPROM]: EEPROM memory detected fault [External]: External fault [INTERNAL FAULT]: Unknown rating [INTERNAL FAULT]: HMI card not recognized or incompatible/display absent [INTERNAL FAULT]: EEPROM detected fault [INTERNAL FAULT]: Industrial EEPROM detected fault [4-20mA]: 4-20 mA loss [No fault]: No fault code saved [Overbraking]: DC bus overvoltage [Overcurrent]: Overcurrent [Drive overheat]: Drive overheating [Motor overload]: Motor overload [Mot. phase]: Motor phase loss [Mains overvoltage]: Line supply overvoltage [Mains phase loss]: Line phase loss [Mot. short circuit]: Motor short-circuit (phase, ground) [Modbus]: Modbus communication detected fault [Overspeed]: Motor overspeed [Auto-tuning]: Auto-tuning detected fault [Undervoltage]: Line supply undervoltage		
LI1A	104	[Config.LI1]	-	-			
LI2A	104	[Config.LI2]	-	-			
LI3A	104	[Config.LI3]	-	-			
LI4A	104	[Config.LI4]	-	-			
LI5A	104	[Config.LI5]	-	-			
LI6A	104	[Config.LI6]	-	-			
LSP	33 84	[Low speed]	Hz	0 to HSP	-	0	
nCr	41	[Rated mot. current]	In	0.25 to 1.5	-	In accordance with the drive rating	
nCr2	88	[Nom. mot. 2 current]	In	0.25 to 1.5	-	In accordance with the drive rating	
nrd	44	[Noise reduction]	-	YES nO	[Yes]: Frequency with random modulation [No]: Fixed frequency	YES	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
nSP	42	[Rated motor speed]	rpm	0 to 32,760	-	In accordance with the drive rating	
nSP2	88	[Nom. mot. 2 speed]	rpm	0 to 32,760	-	In accordance with the drive rating	
nSt	67	[Freewheel stop ass.]	-	no LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	no	
oICt	103	[OPT1 card type]	-			YES	
oHL	94	[Overtemp fault mgt]	-	no YES rnP FSt	[Ignore]: Ignore [Freewheel]: Detected fault management with freewheel stop [Ramp stop]: Detected fault management with stop on ramp [Fast stop]: Detected fault management with fast stop	YES	
oLL	94	[Overload fault mgt]	-	no YES rnP FSt	[Ignore]: Ignore [Freewheel]: Detected fault management with freewheel stop [Ramp stop]: Detected fault management with stop on ramp [Fast stop]: Detected fault management with fast stop	YES	
oPL	94	[Output Phase Loss]	-	no YES oAC	[No]: Function inactive [Yes]: Tripping on oPF [Output cut]: No tripping on [MOTOR PHASE LOSS] (OPF), but output voltage is managed	YES	
oPr	101	[Motor power]	%	-	-	-	
otr	102	[Motor torque]	%	-	-	-	
PIC	36 80	[PID correct. reverse]	-	no YES	[No]: Normal [Yes]: Reverse	no	
PIF	80	[PID feedback ass.]	-	no AI1 AI2 AI3	[No]: Not assigned [AI1]: Analog input AI1 [AI2]: Analog input AI2 [AI3]: Analog input AI3	no	
PI1	82	[Act. internal PID ref.]	-	no YES	[No]: The reference for the PI regulator is Fr1, except for uPdH and uPdt. [Yes]: The reference for the PI regulator is provided internally via the rPI parameter.	no	
Pr2	80	[2 preset PID ref.]	-	no LI1 LI2 LI3 LI4 LI5 LI6 Cd11 Cd12 Cd13 Cd14 Cd15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	no	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
PrH	81	[4 preset PID ref.]	-	no LI1 LI2 LI3 LI4 LI5 LI6 CD11 CD12 CD13 CD14 CD15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	no	
PS16	73	[16 preset speeds]	-	no LI1 LI2 LI3 LI4 LI5 LI6 CD11 CD12 CD13 CD14 CD15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	no	
PS2	72	[2 preset speeds]	-	no LI1 LI2 LI3 LI4 LI5 LI6 CD11 CD12 CD13 CD14 CD15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	LI3	
PS4	72	[4 preset speeds]	-	no LI1 LI2 LI3 LI4 LI5 LI6 CD11 CD12 CD13 CD14 CD15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	LI4	
PS8	72	[8 preset speeds]	-	no LI1 LI2 LI3 LI4 LI5 LI6 CD11 CD12 CD13 CD14 CD15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	no	
PSt	61	[[Stop Key priority]]	-	no YES	[No]: Function inactive [Yes]: STOP key priority	YES	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
r1	49	[R1 Assignment]	-	no FLt run FtA FLA CtA SrA tSA APL LI1 to LI6	[No]: Not assigned [No drive flt]: No drive detected fault [Drv running] : Drive running [Freq.Th.att.]: Frequency threshold reached [HSP attain.] : High speed reached [I attained] : Current threshold reached [Freq.ref.att]: Frequency reference reached [Th.mot. att.]: Motor thermal threshold reached [4-20mA]: Loss of 4-20 mA signal [LI1] to [LI6]: Returns the value of the selected logic input	FLt	
r2	49	[R2 Assignment]		no FLt run FtA FLA CtA SrA tSA bLC APL LI1 to LI6	[No]: Not assigned [No drive flt]: No drive detected fault [Drv running] : Drive running [Freq.Th.att.]: Frequency threshold reached [HSP attain.] : High speed reached [I attained] : Current threshold reached [Freq.ref.att]: Frequency reference reached [Th.mot. att.]: Motor thermal threshold reached [Brk control]: Brake sequence [4-20mA]: Loss of 4-20 mA signal [LI1] to [LI6]: Returns the value of the selected logic input	no	
rFC	59	[Ref. 2 switching]	-	Fr1 Fr2 LI1 LI2 LI3 LI4 LI5 LI6 C111 C112 C113 C114 C115 C211 C212 C213 C214 C215	[ch1 active] : Reference 1 [ch2 active] : Reference 2 [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [C111]: Bit 11 of Modbus control word [C112]: Bit 12 of Modbus control word [C113]: Bit 13 of Modbus control word [C114]: Bit 14 of Modbus control word [C115]: Bit 15 of Modbus control word [C211]: Bit 11 of network control word [C212]: Bit 12 of network control word [C213]: Bit 13 of network control word [C214]: Bit 14 of network control word [C215]: Bit 15 of network control word	Fr1	
rFr	101	[Output frequency]	Hz	-500 to +500	-	-	
rIG	36 80	[PID integral gain]	-	0.01 to 100	-	1	
rot	61	[Rotating direction]	-	dFr drS bot	[Forward]: Forward [Reverse]: Reverse [Both]: Both directions are authorized.	dFr	
rP	97	[Product reset]	-	no YES	[No]: No [Yes]: Yes	no	
rP2	36 81	[Preset ref. PID 2]	%	0 to 100	-	30	
rP3	36 81	[Preset ref. PID 3]	%	0 to 100	-	60	
rP4	36 81	[Preset ref. PID 4]	%	0 to 100	-	90	
rPG	36 80	[PID prop. gain]	-	0.01 to 100	-	1	
rPI	32 82 101	[Internal PID ref.]	%	0 to 100	-	0	
rPr	97	[Operating t. reset]	-	no rtH	[No]: No [rst. runtime]: Operating time reset to zero	no	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
rPS	64	[Ramp switch ass.]	-	nO LI1 LI2 LI3 LI4 LI5 LI6 Cd11 Cd12 Cd13 Cd14 Cd15	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6 [CD11]: Bit 11 of the control word from a communication network [CD12]: Bit 12 of the control word from a communication network [CD13]: Bit 13 of the control word from a communication network [CD14]: Bit 14 of the control word from a communication network [CD15]: Bit 15 of the control word from a communication network	nO	
rPt	62	[Ramp type]	-	LIn S U CUS	[Linear]: Linear [S ramp]: S ramp [U ramp]: U ramp [Customized]: Customized	LIn	
rrS	48	[Reverse assign.]	-	nO LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 can be accessed if tCC = 2C. [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	LI2	
rSC	42	[Cold stator resist.]	-	nO InIt 0000	[NO]: Function inactive [Init]: Activates the function Value of cold state stator resistance used	nO	
rSF	92	[Fault reset]	-	nO LI1 LI2 LI3 LI4 LI5 LI6	[No]: Not assigned [LI1]: Logic input LI1 [LI2]: Logic input LI2 [LI3]: Logic input LI3 [LI4]: Logic input LI4 [LI5]: Logic input LI5 [LI6]: Logic input LI6	nO	
rSL	38 82	[PID wake up thresh.]	%	0 to 100	-	0	
rtH	102	[Run time]	Time	-	-	-	
SA2	70	[Summing ref. 2]	-	nO AI1 AI2 AI3 AIU1 LCC ndb nEt	[No]: Not assigned [AI1]: Analog input AI1 [AI2]: Analog input AI2 [AI3]: Analog input AI3 [Network AI]: Jog dial [HMI]: Reference via the remote display terminal [Modbus]: Reference via Modbus [Network]: Reference via network	AI2	
SA3	70	[Summing ref. 3]	-	nO AI1 AI2 AI3 AIU1 LCC ndb nEt	[No]: Not assigned [AI1]: Analog input AI1 [AI2]: Analog input AI2 [AI3]: Analog input AI3 [Network AI]: Jog dial [HMI]: Reference via the remote display terminal [Modbus]: Reference via Modbus [Network]: Reference via network	nO	
SCS	45 49 61 90	[Saving config.]	-	nO Str1	[No]: Function inactive [Config 1] : Saves the current configuration to EEPROM	nO	
SdC1	35 68	[Auto DC inj. level 1]	In	0 to 1.2	-	0.7	
SdC2	35 69	[Auto DC inj. level 2]	In	0 to 1.2	-	0.5	
SdS	40	[Scale factor display]	-	0.1 to 200	-	30	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
SFr	40 44	[Switching freq.]	kHz	2.0 to 16	-	4	
SLL	95	[Modbus fault mgt]	-	nO YES rnP FSt	[Ignore]: Ignore [Freewheel]: Detected fault management with freewheel stop. [Ramp stop]: Detected fault management with stop on ramp [Fast stop]: Detected fault management with fast stop	YES	
SLP	34	[Slip compensation]	%	0 to 150	-	100	
SLP2	39 88	[Slip compensation 2]	%	0 to 150	-	100	
SP10	37 73	[Preset speed 10]	Hz	0 to 500	-	50	
SP11	37 74	[Preset speed 11]	Hz	0 to 500	-	55	
SP12	37 74	[Preset speed 12]	Hz	0 to 500	-	60	
SP13	37 74	[Preset speed 13]	Hz	0 to 500	-	70	
SP14	37 74	[Preset speed 14]	Hz	0 to 500	-	80	
SP15	37 74	[Preset speed 15]	Hz	0 to 500	-	90	
SP16	37 74	[Preset speed 16]	Hz	0 to 500	-	100	
SP2	36 73	[Preset speed 2]	Hz	0 to 500	-	10	
SP3	37 73	[Preset speed 3]	Hz	0 to 500	-	15	
SP4	37 73	[Preset speed 4]	Hz	0 to 500	-	20	
SP5	37 73	[Preset speed 5]	Hz	0 to 500	-	25	
SP6	37 73	[Preset speed 6]	Hz	0 to 500	-	30	
SP7	37 73	[Preset speed 7]	Hz	0 to 500	-	35	
SP8	37 73	[Preset speed 8]	Hz	0 to 500	-	40	
SP9	37 73	[Preset speed 9]	Hz	0 to 500	-	45	
SPd1	101	[Cust. output value]	-	-	-	-	
SPd2	101	[Cust. output value]	-	-	-	-	
SPd3	101	[Cust. output value]	-	-	-	-	
SrF	44	[Speed loop filter]	-	nO YES	[No]: Filter remains active [Yes]: Filter suppressed	nO	
StA	34	[Fr.Loop.Stab]	%	1 to 100	-	20	
StA2	39 88	[Freq. loop stability 2]	%	0 to 100	-	20	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
StP	96	[UnderV. prevention]	-	no rnS rMP FSt	[No]: Locking of the drive and freewheel stopping of the motor [DC Maintain]: Stop mode using inertia to maintain the drive power supply as long as possible [Ramp stop]: Stop according to the valid ramp [Fast stop]: Fast stop	no	
Str	77	[Reference saved]	-	no rAn EEP	[No]: No saving [RAM]: Saving in RAM [EEprom]: Saving in EEPROM	no	
Stt	65	[Type of stop]	-	rMP FSt nSt dC I	[Ramp stop]: On ramp [Fast stop]: Fast stop [Freewheel]: Freewheel stop [DC injection]: DC injection stop	rMP	
tA1	33 63	[Begin Acc round]	%	0 to 100	-	10	
tA2	33 63	[End Acc round]	%	0 to (100 - tA1)	-	10	
tA3	33 63	[Begin Dec round]	%	0 to 100	-	10	
tA4	33 63	[End Dec round]	%	0 to (100 - tA3)	-	10	
tAr	92	[Max. restart time]	-	5 10 30 1h 2h 3h Ct	[5 minutes]: 5 minutes [10 minutes]: 10 minutes [30 minutes]: 30 minutes [1 hour]: 1 hour [2 hours]: 2 hours [3 hours]: 3 hours [Unlimited]: Unlimited	5	
tbr	98	[Modbus baud rate]	bps	4.8 9.6 19.2	[4.8 Kbps]: 4,800 bits/second [9.6 Kbps]: 9600 bits/second [19.2 Kbps]: 19,200 bits/second	19.2	
tCC	30 47	[2/3 wire control]	-	2C 3C LoC	[2 wire]: 2-wire control [3 wire]: 3-wire control [Local]: Local control (drive RUN/STOP/RESET)	2C	
tCt	47	[2 wire type]	-	LEL trn PFo	[Level]: State 0 or 1 [Transition]: Change of state (transition or edge) [Fwd priority]: State 0 or 1, "forward" input takes priority over the "reverse" input	trn	
tdC	34 67	[DC injection time 2]	s	0.1 to 30	-	0.5	
tdC1	34 68	[Auto DC inj. time 1]	s	0.1 to 30	-	0.5	
tdC2	35 69	[Auto DC inj. time 2]	s	0 to 30	-	0	
tFo	98	[Modbus format]	-	8o1 8E1 8n1 8n2	[8-O-1]: 8 data bits, odd parity, 1 stop bit [8-E-1]: 8 data bits, even parity, 1 stop bit [8-N-1]: 8 data bits, no parity, 1 stop bit [8-N-2]: 8 data bits, no parity, 2 stop bits	8E1	
tFr	44	[Max frequency]	Hz	10 to 500	-	60	
tHd	101	[Drv. Therm att.]	-	-	-	-	
tHr	101	[Motor thermal state]	-	-	-	-	
tLS	38	[Low speed time out]	s	0 to 999.9	-	0	

Index of parameter codes and customer settings

Code	Page	Name	Unit	Value/Possible function		Factory setting	Customer setting
tnL	95	[Autotune fault mgt]	-	nO YES	[No]: Ignore [Yes]: Detected fault management with drive locked	YES	
ttd	39	[Motor therm. level]	%	1 to 118	-	100	
tto	98	[Modbus time out]	s	0.1 to 30	-	10	
tun	43	[Auto tuning]	-	nO YES donE run POn LI1 to LI6	[No]: Auto-tuning not performed [Yes]: Auto-tuning performed as soon as possible [Done]: Use of the values given the last time auto-tuning was performed [Drv running]: Auto-tuning performed every time a run command is sent [Power on]: Auto-tuning performed on every power-up [LI1] to [LI6]: Auto-tuning performed on the transition from 0 ➡ 1 of a logic input assigned to this function	nO	
tuS	43 103	[Auto tuning state]	-	tAb PEnd PrOG FAIL donE Strd CuS	[Not done]: Default stator resistance value used to control the motor [Pending]: Auto-tuning requested but not yet performed [In progress]: Auto-tuning in progress [Failed]: Auto-tuning failed [Done]: Stator resistance measured by the auto-tuning function used to control the motor [Entered R1]: Cold state stator resistance used to control the motor The value of [Cold stator resist.] (rSC) is set manually	tAb	
udP	103	[Drv.Soft.Ver]	-	-	-	-	
uFr	33	[IR compensation]	%	0 to 100	-	20	
uFr2	39 88	[IR compensation 2]	%	0 to 100	-	20	
uFt	44	[U/F mot 1 selected]	-	L P n nLd	[Cst. torque]: Constant torque [Var. torque] : Variable torque [SVC]: Flux vector control [Energy sav.]: Energy saving	n	
uFt2	88	[U/F mot.2 selected]	-	L P n nLd	[Cst. torque]: Constant torque [Var. torque] : Variable torque [SVC]: Flux vector control [Energy sav.]: Energy saving	n	
uLn	101	[Mains voltage]	V	-	-	-	
unS	41	[Rated motor volt.]	V	-	-	In accordance with the drive rating	
unS2	87	[Nom. mot. 2 volt.]	V	-	-	In accordance with the drive rating	

Product data sheet
Characteristics

TM221C16R
controller M221 16 IO relay

Main

Range of product	Modicon M221
Product or component type	Logic controller
[Us] rated supply voltage	100...240 V AC
Discrete input number	9 discrete input conforming to IEC 61131-2 Type 1
Analogue input number	2 at input range: 0...10 V
Discrete output type	Relay normally open
Discrete output number	7 relay
Discrete output voltage	5...125 V DC 5...250 V AC
Discrete output current	2 A

Complementary

Discrete I/O number	16
Number of I/O expansion module	<= 4 for transistor output <= 4 for relay output
Supply voltage limits	85...264 V
Network frequency	50/60 Hz
Inrush current	<= 40 A
Power consumption in VA	<= 46 VA at 100...240 V with max number of I/O expansion module <= 31 VA at 100...240 V without I/O expansion module
Power supply output current	0.325 A at 5 V for expansion bus 0.12 A at 24 V for expansion bus
Discrete input logic	Sink or source (positive/negative)
Discrete input voltage	24 V
Discrete input voltage type	DC
Analogue input resolution	10 bits
LSB value	10 mV
Conversion time	1 ms per channel + 1 controller cycle time for analog input
Permitted overload on inputs	+/- 30 V DC for analog input with 5 min maximum +/- 13 V DC for analog input permanent

Voltage state1 guaranteed	>= 15 V for input
Voltage state 0 guaranteed	<= 5 V for input
Discrete input current	7 mA for discrete input 5 mA for fast input
Input impedance	4.9 kOhm for fast input 3.4 kOhm for discrete input 100 kOhm for analog input
Response time	10 ms turn-on operation for output 35 µs turn-off operation for input; I2...I5 terminal 10 ms turn-off operation for output 5 µs turn-on operation for fast input; I0, I1, I6, I7 terminal 35 µs turn-on operation for input; other terminals terminal 5 µs turn-off operation for fast input; I0, I1, I6, I7 terminal 100 µs turn-off operation for input; other terminals terminal
Configurable filtering time	0 ms for input 12 ms for input 3 ms for input
Output voltage limits	125 V DC 277 V AC
Current per output common	6 A at COM 1 termnal 7 A at COM 0 termnal
Absolute accuracy error	+/- 1 % of full scale for analog input
Electrical durability	Inductive AC-15, (cos phi = 0.35) 240 V / 120 VA : 100000 cycles Resistive DC-12, 24 V / 48 W : 100000 cycles Resistive AC-12, 120 V / 240 VA : 100000 cycles Inductive AC-15, (cos phi = 0.35) 240 V / 36 VA : 300000 cycles Resistive AC-12, 120 V / 80 VA : 300000 cycles Inductive (L/R = 7 ms) DC-13, 24 V / 24 W : 100000 cycles Resistive DC-12, 24 V / 16 W : 300000 cycles Inductive (L/R = 7 ms) DC-13, 24 V / 7.2 W : 300000 cycles Inductive AC-14, (cos phi = 0.7) 240 V / 240 VA : 100000 cycles Inductive AC-15, (cos phi = 0.35) 120 V / 60 VA : 100000 cycles Inductive AC-14, (cos phi = 0.7) 240 V / 72 VA : 300000 cycles Inductive AC-15, (cos phi = 0.35) 120 V / 18 VA : 300000 cycles Resistive AC-12, 240 V / 480 VA : 100000 cycles Inductive AC-14, (cos phi = 0.7) 120 V / 120 VA : 100000 cycles Resistive AC-12, 240 V / 160 VA : 300000 cycles Inductive AC-14, (cos phi = 0.7) 120 V / 36 VA : 300000 cycles
Switching frequency	20 switching operations/minute with maximum load
Mechanical durability	>= 20000000 cycles for relay output
Minimum load	1 mA at 5 V DC for relay output
Protection type	Without protection at 5 A
Reset time	1 s
Memory capacity	256 kB for user application and data RAM with 10000 instructions 256 kB for internal variables RAM
Data backed up	256 kB built-in flash memory for backup of application and data
Data storage equipment	2 GB SD card optional
Battery type	BR2032 lithium non-rechargeable, battery life: 4 yr
Backup time	1 year at 25 °C by interruption of power supply
Execution time for 1 KInstruction	0.3 ms for event and periodic task
Execution time per instruction	0.2 µs Boolean
Exct time for event task	60 µs response time
Maximum size of object areas	8000 %MW memory words 512 %KW constant words 255 %TM timers 512 %M memory bits 255 %C counters
Realtime clock	With
Clock drift	<= 30 s/month at 25 °C
Regulation loop	Adjustable PID regulator up to 14 simultaneous loops
Counting input number	4 fast input (HSC mode) (counting frequency: 100 kHz), counting capacity: 32 bits
Control signal type	Dual phase (quadrature) Frequency meter

	Single phase Dual phase (pulse/direction)
Integrated connection type	USB port with connector mini B USB 2.0 Non isolated serial link "serial 1" with connector RJ45 and interface RS485 Non isolated serial link "serial 2" with connector RJ45 and interface RS232/RS485
Supply	Serial serial link supply at 5 V 200 mA
Transmission rate	1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m - communication protocol: RS485 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m - communication protocol: RS232 480 Mbit/s - communication protocol: USB
Communication port protocol	USB port : USB protocol - SoMachine-Network Non isolated serial link : Modbus protocol master/slave - RTU/ASCII or SoMachine-Network
Local signalling	1 LED green for SD card access (SD) 1 LED red for BAT 1 LED green for SL1 1 LED green for SL2 1 LED per channel green for I/O state 1 LED red for module error (ERR) 1 LED green for PWR 1 LED green for RUN
Electrical connection	Mini B USB 2.0 connector for a programming terminal Terminal block, 3 terminal(s) for connecting the 24 V DC power supply Connector, 4 terminal(s) for analogue inputs Removable screw terminal block for inputs Removable screw terminal block for outputs
Cable length	<= 10 m shielded cable for fast input <= 30 m unshielded cable for output <= 30 m unshielded cable for digital input <= 1 m unshielded cable for analog input
Insulation	2300 V AC between output and internal logic Non-insulated between analogue inputs 500 V AC between input and internal logic Non-insulated between analogue input and internal logic 1500 V AC between supply and ground 500 V AC between sensor power supply and ground 500 V AC between input and ground 1500 V AC between output and ground 2300 V AC between supply and internal logic 500 V AC between sensor power supply and internal logic 500 V AC between Ethernet terminal and internal logic 2300 V AC between supply and sensor power supply
Marking	CE
Sensor power supply	24 V DC at 250 mA supplied by the controller
Mounting support	Top hat type TH35-15 rail conforming to IEC 60715 Top hat type TH35-7.5 rail conforming to IEC 60715 Plate or panel with fixing kit
Height	90 mm
Depth	70 mm
Width	95 mm
Product weight	0.346 kg

Environment

Standards	EN/IEC 61010-2-201 EN/IEC 60664-1 EN/IEC 61131-2
Product certifications	DNV-GL EAC ABS IACS E10 CSA LR cULus RCM
Environmental characteristic	Ordinary and hazardous location
Resistance to electrostatic discharge	4 kV on contact conforming to EN/IEC 61000-4-2 8 kV in air conforming to EN/IEC 61000-4-2
Resistance to electromagnetic fields	10 V/m (80 MHz...1 GHz) conforming to EN/IEC 61000-4-3

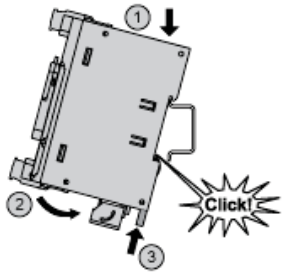
	3 V/m (1.4 GHz...2 GHz) conforming to EN/IEC 61000-4-3 1 V/m (2...2.7 GHz) conforming to EN/IEC 61000-4-3
Resistance to magnetic fields	30 A/m at 50...60 Hz conforming to EN/IEC 61000-4-8
Resistance to fast transients	2 kV for power lines conforming to EN/IEC 61000-4-4 2 kV for relay output conforming to EN/IEC 61000-4-4 1 kV for Ethernet line conforming to EN/IEC 61000-4-4 1 kV for serial link conforming to EN/IEC 61000-4-4 1 kV for I/O conforming to EN/IEC 61000-4-4
Surge withstand	2 kV for power lines (AC) in common mode conforming to EN/IEC 61000-4-5 2 kV for relay output in common mode conforming to EN/IEC 61000-4-5 1 kV for I/O in common mode conforming to EN/IEC 61000-4-5 1 kV for shielded cable in common mode conforming to EN/IEC 61000-4-5 0.5 kV for power lines (DC) in differential mode conforming to EN/IEC 61000-4-5 1 kV for power lines (AC) in differential mode conforming to EN/IEC 61000-4-5 1 kV for relay output in differential mode conforming to EN/IEC 61000-4-5 0.5 kV for power lines (DC) in common mode conforming to EN/IEC 61000-4-5
Resistance to conducted disturbances, induced by radio frequency fields	10 Vrms (0.15...80 MHz) conforming to EN/IEC 61000-4-6 3 Vrms (0.1...80 MHz) conforming to Marine specification (LR, ABS, DNV, GL) 10 Vrms (spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz)) conforming to Marine specification (LR, ABS, DNV, GL)
Electromagnetic emission	Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.15...0.5 MHz : 79 dBµV/m QP/66 dBµV/m AV Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.5...300 MHz : 73 dBµV/m QP/60 dBµV/m AV Conducted emissions conforming to EN/IEC 55011 power lines, 10...150 kHz : 120...69 dBµV/m QP Conducted emissions conforming to EN/IEC 55011 power lines, 150 kHz...1.5 MHz : 79...63 dBµV/m QP Conducted emissions conforming to EN/IEC 55011 power lines, 1.5...30 MHz : 63 dBµV/m QP Radiated emissions conforming to EN/IEC 55011 class A 10 m, 30...230 MHz : 40 dBµV/m QP Radiated emissions conforming to EN/IEC 55011 class A 10 m, 200 MHz...1 GHz : 47 dBµV/m QP
Immunity to microbreaks	10 ms
Ambient air temperature for operation	-10...55 °C for horizontal installation -10...35 °C for vertical installation
Ambient air temperature for storage	-25...70 °C
Relative humidity	10...95 % without condensation in operation 10...95 % without condensation in storage
IP degree of protection	IP20 with protective cover in place
Pollution degree	<= 2
Operating altitude	0...2000 m
Storage altitude	0...3000 m
Vibration resistance	3.5 mm (vibration frequency: 5...8.4 Hz) on symmetrical rail 1 gn (vibration frequency: 8.4...150 Hz) on symmetrical rail 3.5 mm (vibration frequency: 5...8.4 Hz) on panel mounting 1 gn (vibration frequency: 8.4...150 Hz) on panel mounting
Shock resistance	98 m/s² (test wave duration:11 ms)

Offer Sustainability

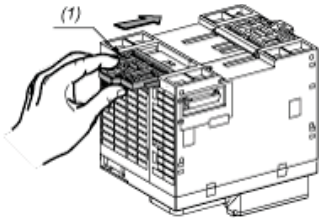
Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1415 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available Product environmental
Product end of life instructions	Available End of life manual

Dimensions

Mounting on a Rail

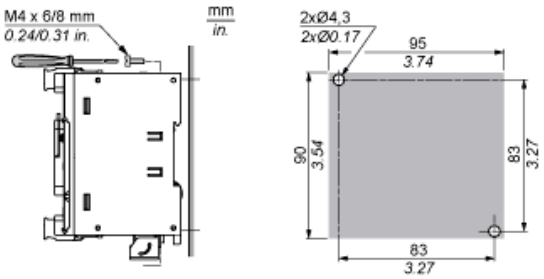


Direct Mounting on a Panel Surface



(1) Install a mounting strip

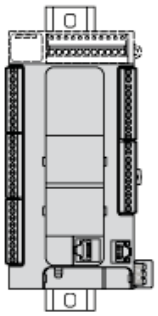
Mounting Hole Layout



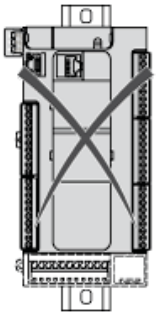
Mounting

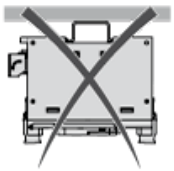
Correct Mounting Position

Acceptable Mounting Position



Incorrect Mounting Position

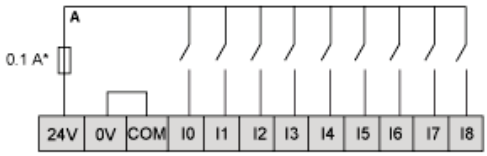




Clearance

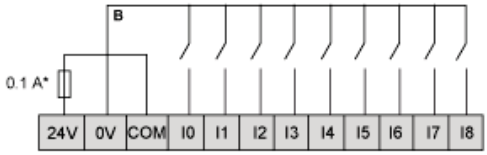
Digital Inputs

Wiring Diagram (Positive Logic)



(*) Type T fuse

Wiring Diagram (Negative Logic)



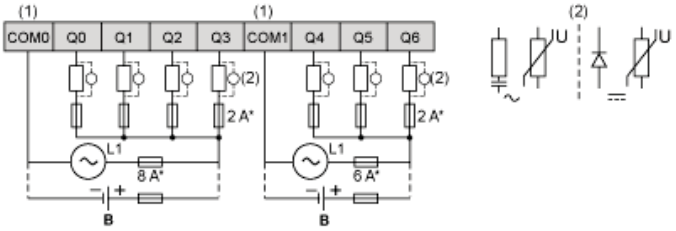
(*) Type T fuse

Connection of the Fast Inputs

I0, I1, I6, I7

Relay Outputs

Negative Logic (Sink)

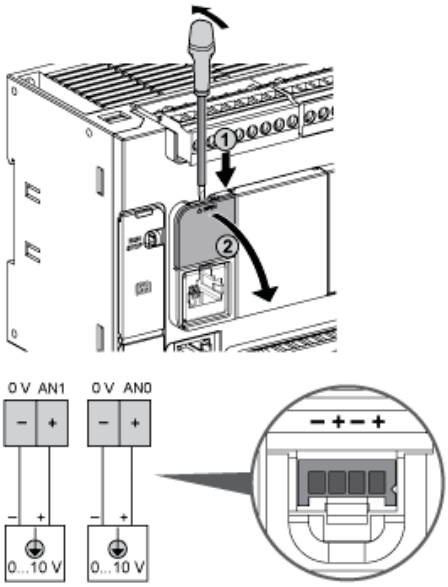


(*) Type T fuse
(1) The COM1 and COM2 terminals are not connected internally.
(2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each i
B Sink wiring (negative logic)

Positive Logic (Source)

(*) Type T fuse
(1) The COM1 and COM2 terminals are not connected internally.
(2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each i
A Source wiring (positive logic)

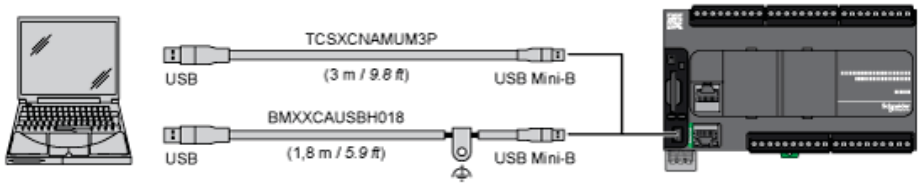
Analog Inputs



The (-) poles are connected internally.

Pin	Wire Color
0 V	Black
AN1	Red
0 V	Black
AN0	Red

USB Mini-B Connection



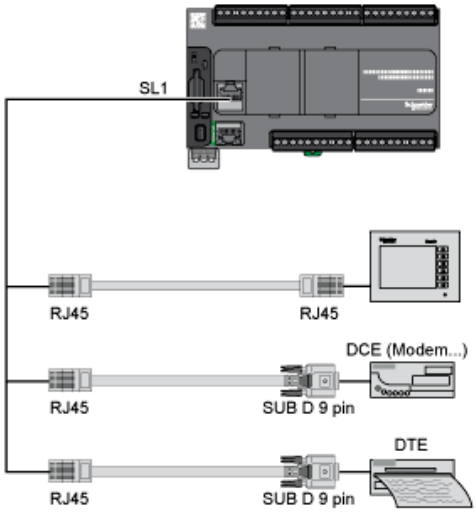
SL1 Connection

SL1

N °	RS 232	RS 485
1	RxD	N.C.
2	TxD	N.C.
3	RTS	N.C.
4	N.C.	D1
5	N.C.	D0
6	CTS	N.C.
7	N.C*.	5 Vdc
8	Common	Common

N.C.: not connected

* : 5 Vdc delivered by the controller. Do not connect.



SL2 Connection

N °	RS 485
1	N.C.
2	N.C.
3	N.C.
4	D1
5	D0
6	N.C.
7	N.C.
8	Common

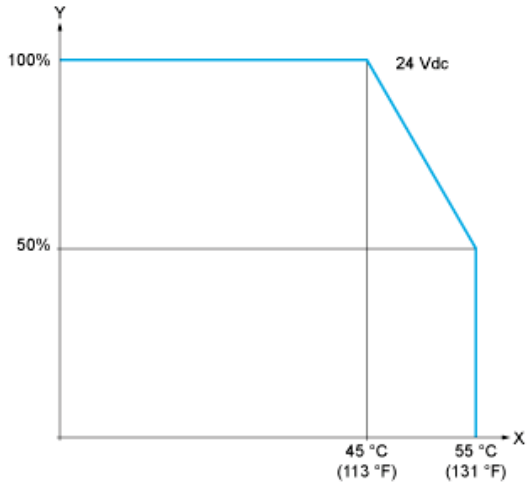
N.C.: not connected

Derating Curves

Embedded Digital Inputs (No Cartridge)

X : Ambient temperature
Y : Input simultaneous ON ratio

Embedded Digital Inputs (with Cartridge)



X : Ambient temperature
Y : Input simultaneous ON ratio

Product data sheet
Characteristics

TM3AI2H
module TM3 - 2 analog inputs high resolution

Product availability : Stock - Normally stocked in distribution facility

Price* : 179.00 USD

Main

Range of product	Modicon TM3
Product or component type	Analog input module
Range compatibility	Modicon M251 Modicon M221 Modicon M241
Analogue input number	2
Analogue input type	Current, analogue input range: 4...20 mA Current, analogue input range: 0...20 mA Voltage, analogue input range: 0...10 V Voltage, analogue input range: - 10...10 V

Complementary

Analogue input resolution	15 bits + sign 16 bits
Permissible continuous overload	13 V voltage 40 mA current
Input impedance	<= 50 Ohm current >= 1 MOhm voltage
LSB value	2.44 mV, analogue input: 0...10 V voltage 4.88 mV, analogue input: - 10...10 V voltage 4.88 µA, analogue input: 0...20 mA current 3.91 µA, analogue input: 4...20 mA current
Conversion time	1 ms + 1 ms per channel + 1 controller cycle time
Sampling duration	<= 1 ms
Absolute accuracy error	+/- 0.1 % of full scale at 77 °F (25 °C) +/- 1 % of full scale
Temperature drift	+/- 0.006 %FS/°C
Repeat accuracy	+/-0.5 %FS
Non-linearity	+/- 0.01 %FS
Cross talk	<= 1 LSB
[Us] rated supply voltage	24 V DC

Supply voltage limits	20.4...28.8 V
Type of cable	<= 98.43 ft (30 m) twisted shielded pairs cable for input circuit
Current consumption	30 mA at 5 V DC (no load) via bus connector 40 mA at 5 V DC (full load) via bus connector 25 mA at 24 V DC via external supply
Local signalling	1 LED green PWR
Electrical connection	11 x 2.5 mm² removable screw terminal block with pitch 5.08 mm adjustment for inputs and supply
Insulation	500 V AC between input and internal logic 1500 V AC between input and supply
Marking	CE
Surge withstand	1 kV for power supply with common mode protection conforming to EN/IEC 61000-4-5 0.5 kV for power supply with differential mode protection conforming to EN/IEC 61000-4-5 1 kV for input with common mode protection conforming to EN/IEC 61000-4-5
Mounting support	Top hat type TH35-15 rail conforming to IEC 60715 Top hat type TH35-7.5 rail conforming to IEC 60715 Plate or panel with fixing kit
Height	3.54 in (90 mm)
Depth	2.76 in (70 mm)
Width	0.93 in (23.6 mm)
Product weight	0.25 lb(US) (0.115 kg)

Environment

Standards	EN/IEC 61010-2-201 EN/IEC 61131-2
Resistance to electrostatic discharge	4 kV on contact conforming to EN/IEC 61000-4-2 8 kV in air conforming to EN/IEC 61000-4-2
Resistance to electromagnetic fields	9.14 V/yd (10 V/m) at 80 MHz...1 GHz conforming to EN/IEC 61000-4-3 2.74 V/yd (3 V/m) at 1.4 GHz...2 GHz conforming to EN/IEC 61000-4-3 0.91 V/yd (1 V/m) at 2 GHz...3 GHz conforming to EN/IEC 61000-4-3
Resistance to magnetic fields	9.14 A/ft (30 A/m) at 50...60 Hz conforming to EN/IEC 61000-4-8
Resistance to fast transients	1 kV I/O conforming to EN/IEC 61000-4-4
Resistance to conducted disturbances, induced by radio frequency fields	10 V at 0.15...80 MHz conforming to EN/IEC 61000-4-6 3 V at spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz) conforming to Marine specification (LR, ABS, DNV, GL)
Electromagnetic emission	Radiated emissions, test level: 40 dBµV/m QP class A (10 m at 30...230 MHz) conforming to EN/IEC 55011 Radiated emissions, test level: 47 dBµV/m QP class A (10 m at 230 MHz...1 GHz) conforming to EN/IEC 55011
Immunity to microbreaks	10 ms
Ambient air temperature for operation	14...131 °F (-10...55 °C) (horizontal installation) -10...35 °C (vertical installation)
Ambient air temperature for storage	-13...158 °F (-25...70 °C)
Relative humidity	10...95 % without condensation in operation 10...95 % without condensation in storage
IP degree of protection	IP20
Pollution degree	2
Operating altitude	0...6561.68 ft (0...2000 m)
Storage altitude	0...9842.52 ft (0...3000 m)
Vibration resistance	3.5 mm at 5...8.4 Hz with DIN rail mounting support 3 gn at 8.4...150 Hz with DIN rail mounting support
Shock resistance	15 gn during 11 ms

Ordering and shipping details

Category	22533 - M2XX PLC & ACCESSORIES
Discount Schedule	MSX
GTIN	00785901278511
Nbr. of units in pkg.	1
Package weight(Lbs)	0.47999999999999998

Returnability	Y
Country of origin	JP

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1415 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Available

Product Data Sheet

XBTN200

Terminal , Magelis

Technical Characteristics

Marketing Trade Name	Magelis
For Use With	Twido, Modicon TSX Micro, Modicon Premium, Modicon 340
Depth	37mm
Width	132mm
Height	74mm
Application	Ideal for performing diagnostics, adding control and adjusting system settings on simple or compact applications
Display	Matrix Screen - Back-lit LCD
Display Size/Resolution	2 Lines - 20 Characters (Green)
Data Entry	Keypad - 8 keys (4 customizable)
Representation	Alphanumeric
Alarm Log	No
Serial Link Communication	1 RJ45 (RS 232 - RS 485)
Software Type	Vijeo Designer Lite
Download Protocols	Uni-TE, Modbus Master
Supply Voltage	5VDC (or PLC power supply)
Type	XBTN

Shipping and Ordering

Category	22570 - Message Displays and Operator Terminals
Discount Schedule	MC2
Article Number	785901485049
Package Quantity	1
Weight	0.83 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	Y

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

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FEDERAL SIGNAL

Models LP3P, LP3S, LP3T

StreamLine®
Low Profile Strobe Light

Model LP3 is offered in three mounting configurations. LP3P features an integrated 1/2-inch NPT pipe mount. LP3S features a three-hole surface mount — ideal for control panels and other flat or flush surfaces. The "T-mount" LP3T has a popular 2-hole design for wall or flush mounting.

Both the LP3S and LP3T include a surface gasket to complete the Type 4X installation. An optional dome guard is available for use with the LP3S and LP3T. All LP3 units feature a threaded screw-on lens that allows tool-free wiring and strobe tube replacement.

StreamLine® strobes feature high-quality, long-life strobe lamps which are designed to reduce tungsten build-up for longer lamp maintenance cycles. Careful consideration is given to the relationship between lamp shape and lens design for maximum light output. StreamLine products make use of surface mount technology, which provides a more powerful light in a much smaller package. The dry-electrolyte capacitor used in StreamLine products runs cooler than those used in many competitive strobes, resulting in a more reliable product that won't fail due to overheating.

FEATURES

- Available in 12-48VDC, 120VAC and 240VAC
- Surface mount, T-mount, or integrated 1/2-inch NPT pipe mount
- Five dome colors: Amber, Blue, Clear, Green and Red
- Screw-on lens
- Type 4X, IP66 enclosure
- PLC and triac compatible
- Optional dome guard for LP3S and LP3T
- UL and cUL Listed, and CSA Certified

MODEL	VOLTAGE	OPERATING CURRENT	FLASH RATE/ MINUTE	CANDELA PEAK[1]	CANDELA ECP[2]
LP3_*_-012-048__**	12-48VDC	0.44-0.10 amps	65-95	175,000	51.5
LP3_*_-120__**	120VAC	0.10 amps	65-95	175,000	51.5
LP3_*_-240__**	240VAC	0.07 amps	65-95	175,000	51.5

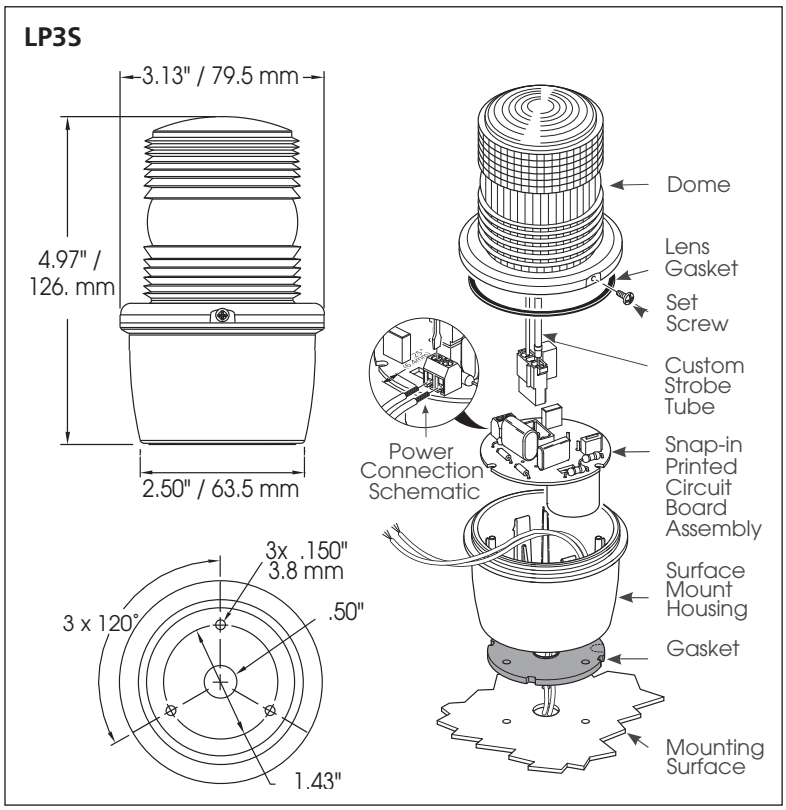
*Indicates Mounting Style: (S) Surface Mount, (P) Pipe Mount, (T) T-Mount

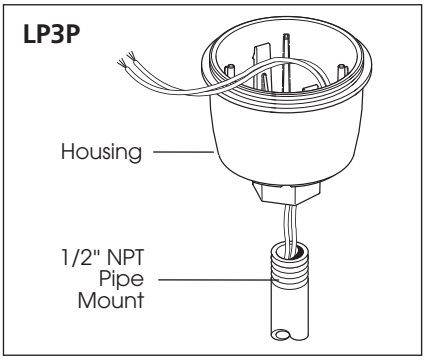
** Indicates color: (A) Amber, (B) Blue, (C) Clear, (G) Green or (R) Red

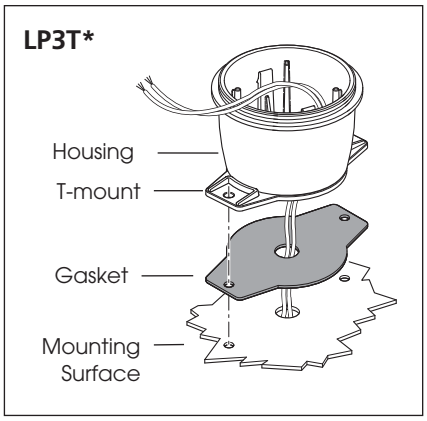
[1] Peak candela is the maximum light intensity generated by a flashing light during its light pulse

[2] ECP (Effective Candela) is the intensity that would appear to an observer if the light were burning steadily

StreamLine® Low Profile Strobe Light (LP3S/LP3P/LP3T)







*LP3T-120 & 240VAC shown

SPECIFICATIONS

Lamp Life:		4,000 Hours
Light Source:		Strobe tube
Operating Temperature:	-31°F to 151°F	-35°C to 66°C
Net Weight:	0.23 lbs	0.1 kg
Shipping Weight:	0.6 lbs	0.27 kg
Height:	2.61"	66.3 mm
Width:	2.33"	59.2 mm
Length:	5.05"	128.3 mm

REPLACEMENT PARTS

Description	Part Number
Dome, Amber	K8589063A
Dome, Blue	K8589063A-01
Dome, Clear	K8589063A-02
Dome, Green	K8589063A-03
Dome, Red	K8589063A-04
Strobe Tube	K149130A
Gasket Kit [1]	K858900353A

[1] Includes gasket for LP3S and LP3T

HOW TO ORDER

LP3 **S** – **120** **A**

TYPE
LP3

MOUNT
S Surface
P Pipe
T T-Mount

VOLTAGE
012-048 (12-48VDC)
120 (120VAC)
240 (240VAC)

COLOR
A Amber
B Blue
C Clear
G Green
R Red

OPTIONAL ACCESSORIES

Description	Part Number
Wire/Dome Guard for LP3S and LP3T	LP3G

LP3G

High Accuracy Submersible Level Transmitter — Acculevel

Thermally-compensated, custom ranges, dual output submersible

The Acculevel by Keller America provides standard features that far exceed those of comparably priced transmitters, including standard ±0.25% FS or optional ±0.1% Total Error Band $(TEB)_3$ accuracy.

The ability of the Acculevel to provide this level of sustained performance over a wide range of operating conditions makes it ideally suited to environmental monitoring applications such as surface water, streams, and reservoirs.

Keller America's guaranteed lightning protection makes this transmitter ideal for installation in areas prone to chronic damage due to transients caused by lightning.

For more information on the Acculevel, or any other Keller product, please contact Keller America, or view the entire Keller catalog at http://www.kelleramerica.com/datasheets.html.

FEATURES

4...20mA models include guaranteed lightning protection at no additional cost.

16-bit internal digital error correction for cost-effective low Total Error Band $(TEB)_3$

316L stainless construction standard - Optional Titanium for severe applications.

2-year warranty covers defects in materials and workmanship.

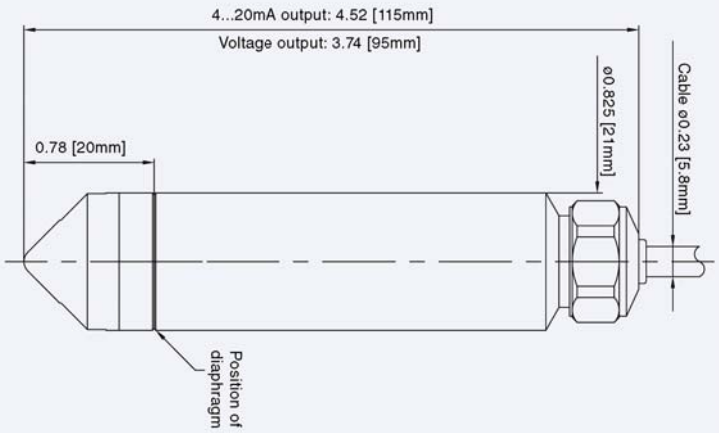
User-rangeable analog output ensures compatibility as requirements change.

RS485 modified-MODBUS compatible interface allows up to 128 transmitters on a single bus.

Standard dual (analog & RS485) outputs simplify interface to controls, data collection, and telemetry systems.

Built in the U.S.A. ARRA Section 1605 Compliant.

Standard 3-day lead time



Output	White	Black	Red	Blue	Yellow
2-wire (mA)	OUT / GND	+Vcc	N/A	RS485A	RS485B
3-wire (VDC)	GND	+VCC	+OUT	RS485A	RS485B
Braided shield wire connected to transmitter housing					

KELLER America Inc.
Newport News, Virginia
www.kelleramerica.com
sales@kelleramerica.com

Edition 01/2017
Subject to alterations
877-253-5537
757-596-6659

Pressure Ranges[1,2]

Relative	Infinite between 0...3 thru 0...900 ft W.C.
Absolute	Infinite between 0...2 thru 0...11 bar

1.The Acculevel can be provided with custom calibration at no extra cost. For fluids other than water, the specific gravity must be given at the time the order is placed.

2. Intermediate ranges are realized by deranging the analog output from the next highest basic range: 1, 3, 10, and 30 bar (relative) 2, 4, and 11 bar (absolute). Level range may be specified in units of lb/in2(psi), inches WC or feet WC. Keller America uses the International Standard conversion of 2.3067 feet WC/psi.

Accuracy[3]

Static	Standard ±0.1% FS, Optional ±0.05% FS
Total Error Band	Standard ±0.25% BR, Optional ±0.1% BR

3. Static accuracy includes the combined effects of non-linearity, hysteresis, and non-repeatability at room temperature (25°C). Total Error Band (TEB) includes the combined effects of non-linearity, hysteresis, and non-repeatability as well as thermal dependencies, over the compensated temperature range, expressed as a percentage of the basic range (BR).

The calculation for maximum TEB on intermediate ranges (IR) is: $TEB_{IR} = (BR/IR) \times TEB_{BR}$

Output

Current	4...20mA + RS485
Voltage[4]	0...5, 0-10VDC + RS485
Resolution[5]	0.002%

4. Other voltage output options available on request.

5. Resolution applies to digital output only. Analog resolution is continuous and limited by the process meter and not the instrument.

Certifications

CE	EN50081-1, EN50082-2

Electrical[6]

Supply (4-20mA)	11-28 VDC
Supply (0-5VDC)	8...28 VDC
Supply (0-10VDC)	13...28 VDC
Load Resistance (mA)	<(Supply-11V)/0.022A
Load Resistance (VDC)	>4k ohm

6. Nominal values may be higher depending upon cable length. Internal lightning protection increases the minimum-required supply voltage from 8VDC to 11VDC, due to internal resistance of the surge protectors. In addition, cable resistance (~70Ω / 1000ft) adds to the supply requirement. In order to insure proper system operation, calculate the minimum required supply voltage (at the source) as follows:

For two-part (internal+external) system (recommended):
MINIMUM SUPPLY VOLTAGE = 11.6 + 0.022 (CABLE LENGTH x 0.07) VDC

For internal only protector (standard with 4-20mA output):
MINIMUM SUPPLY VOLTAGE = 11 + 0.022 (CABLE LENGTH x 0.07) VDC

Environmental

Protection Rating	IP68
Operating Temp.	-10...60° C
Compensated Temp.	-10...80° C
Wetted Materials	316 L Stainless Steel
	Titanium Optional
	Polyamide
	Fluorocarbon
Cable Options	Polyethylene for general purpose
	Hytrel for hydrocarbon
	Tefzel for chemical interaction

Optional Accessories


1/2" NPT Conduit Fitting


Drying Tube Assembly


Bellows Assembly


Cable Hanger


Termination Enclosure


Pressure Test Adapter


Stabilizing Weight


Interface Converter

Process Meter


Open-faced Nose Cap


Signal Line Surge Protector

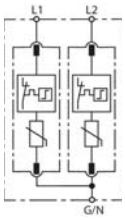
KELLER America Inc.
Newport News, Virginia
www.kelleramerica.com
sales@kelleramerica.com

Edition 01/2017
Subject to alterations
877-253-5537
757-596-6659

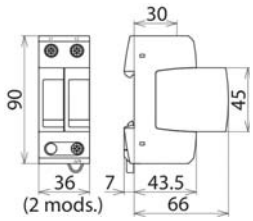
(908 190)

- Prewired complete unit without the need for additional overcurrent protection devices
- High discharge capacity due to heavy-duty zinc oxide varistors (I_{max} 50 kA 8x20µs)
- Short circuit current rating (SCCR) 200 kA
- ANSI/UL 1449 – 4th Ed. Open-Type 1 SPD

Figure without obligation



Basic circuit diagram DG MU SP 240 3W+G



Dimension drawing DG MU SP 240 3W+G

DIN rail mount, pluggable surge arrester consisting of a base part and plug-in protection modules for application in Split Phase systems

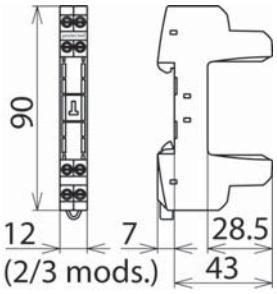
Type Part No.	908 190
SPD classification acc. to ANSI/UL 1449 4th Ed.	Open-Type 1 SPD
SPD classification acc. to CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly
Nominal System Voltage [L-G] / [L-L] (U_N)	127 V a.c. / 254 V a.c.
Nominal Power System Frequency	50 / 60 Hz
Max. Continuous Operating Voltage [L-G] / [L-L] (MCOV)	230 V a.c. / 460 V a.c.
Nominal discharge current (8x20µs) (I_n)	20 kA
Maximal discharge current (8x20µs) (I_{max})	50 kA
Voltage Protection Rating [L-G] / [L-L] (VPR)	700 V_{pk} / 1500 V_{pk}
Additional Overcurrent Protection	Not needed
Short Circuit Current Rating (SCCR)	200 kA
System Type	Split Phase
Operating Temperature Range (T_U)	-35°C…+85°C
Visual Arrester Status (non power consuming design)	Green = Good ; Red = Replace Module
Minimum Wire Size	14 AWG / 2.5 mm^2
Maximum Wire Size	4 AWG / 25 mm^2
Terminal Torque Ratings	35-45 Lbs-in
Mounting	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Degree of protection	IP 20
Capacity	2 module(s), DIN 43880
Approvals	UL, CSA
Weight	NaN
PU	

Accessories

BXT BAS

Base part as a very space-saving and universal four-pole feed-through terminal for the insertion of a protection module without signal disconnection if the protection module is removed.

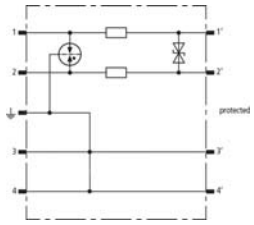
Type Part No.	BXT BAS 920 300
Colour	yellow
Weight	34 g
Customs tariff number	85369010
GTIN	4013364109179
PU	1 pc(s)



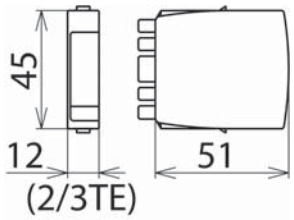
BSP M2 BD 24 (926 244)

- High degree of protection for one pair
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_B – 2 and higher

Figure without obligation



Basic circuit diagram BSP M2 BD 24



Dimension drawing BSP M2 BD 24

Space-saving surge arrester module for protecting one pair of balanced interfaces with galvanic isolation.

Type Part No.	BSP M2 BD 24 926 244
SPD class	TYPE 2 P1
Nominal voltage (U_N)	24 V
Max. continuous operating voltage (d.c.) (U_C)	33 V
Max. continuous operating voltage (a.c.) (U_C)	23.3 V
Nominal current at 45 °C (I_L)	1.0 A
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	1 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	20 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	10 kA
Voltage protection level line-line for I_n C2 (U_p)	≤ 55 V
Voltage protection level line-PG for I_n C2 (U_p)	≤ 600 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 45 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 550 V
Series impedance per line	1.0 ohm(s)
Cut-off frequency line-line (f_G)	7.8 MHz
Capacitance line-line (C)	≤ 1.0 nF
Capacitance line-PG (C)	≤ 16 pF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection (with plugged-in protection module)	IP 20
Pluggable into	BXT BAS / BSP BAS 4 base part
Earthing via	BXT BAS / BSP BAS 4 base part
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21, UL 497B
Approvals	UL, CSA, SIL, EAC
SIL classification	up to SIL3 *)
Weight	21 g
Customs tariff number	85363010
GTIN	4013364127098
PU	1 pc(s)

*) For more detailed information, please visit www.dehn-international.com.

MODEL 112 Control Panel

Single phase, simplex motor contactor control.

The Model 112 control panel provides a reliable means of controlling one 120, 208, or 240 VAC single phase pump in pump chambers, sump pump basins, irrigation systems and lift stations. Two control switches activate a magnetic motor contactor to turn the pump on and off. If an alarm condition occurs, an additional alarm switch activates the audio/visual alarm system.

PANEL COMPONENTS

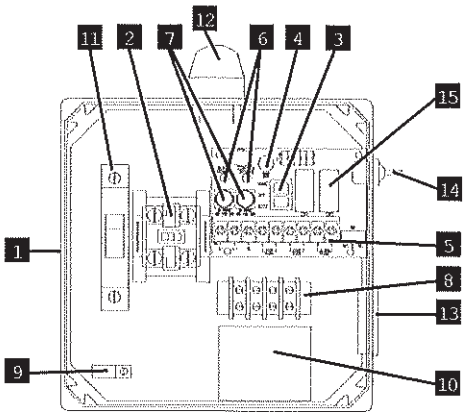
1. Enclosure measures 8 x 8 x 4 inches (20.32 X 20.32 X 10.16 cm). Choice of NEMA 1 (steel for indoor use), or NEMA 4X (ultraviolet stabilized thermoplastic with removable flanges for outdoor or indoor use).

   * Options selected may increase enclosure size and change component layout.
2. Magnetic Motor Contactor controls pump by switching electrical lines.
3. HOA Switch for manual pump control (mounted on circuit board).
4. Green Pump Run Indicator Light (mounted on circuit board).
5. Float Switch Terminal Block (mounted on circuit board).
6. Alarm and Control Fuses (mounted on circuit board).
7. Alarm and Control Power Indicators (mounted on circuit board).
8. Pump Input Power and Pump Connection Terminal Block
9. Ground Lug
10. Terminal Block Installation Label
11. Circuit Breaker (optional) provides pump disconnect and branch circuit protection.

STANDARD ALARM PACKAGE

12. Red Alarm Beacon provides 360° visual check of alarm condition. Note: NEMA 1 style utilizes a door mounted indicator in lieu of a beacon.
13. Alarm Horn provides audio warning of alarm condition (83 to 85 decibel rating). Note: NEMA 1 style utilizes an internally mounted buzzer in lieu of horn.
14. Exterior Alarm Test/Normal/Silence Switch allows horn and light to be tested and horn to be silenced in an alarm condition. Alarm automatically resets once alarm condition has been cleared.
15. Horn Silence Relay (mounted on circuit board).

NOTE: other options available.



Model Shown 1121W914X

FEATURES

- Entire control system (panel and switches) is UL Listed to meet and/or exceed industry safety standards
- Dual safety certification for the United States and Canada
- Standard package includes three 20' Sensor Float® control switches
- Complete with step-by-step installation instructions
- Three-year limited warranty

c UL us LISTED

SJE Rhombus® CONTROLS

112							

MODEL 112

ALARM PACKAGE
- 0 = select options or no alarm package
- 1 = alarm package (includes test/normal/silence switch, fuse, red light, horn & float)

ENCLOSURE RATING
- I = Indoor, NEMA 1 (metal)
- W = Weatherproof, NEMA 4X (engineered thermoplastic)

STARTING DEVICE
- 1 = magnetic motor contactor 120/208/240
- 9 = magnetic motor contactor 120V only

PUMP FULL LOAD AMPS
- 0 = 0-7 FLA
- 1 = 7-15 FLA
- 2 = 15-20 FLA
- 3 = 20-30 FLA

PUMP DISCONNECTS
- 0 = no pump disconnect
- 1 = pull-out with safety deadfront in a 10"x8" enclosure
- 4 = circuit breaker 120V (select STARTING DEVICE option 9 above)
  120/208/240V (select STARTING DEVICE option 1 above)

FLOAT SWITCH APPLICATION
- H or L = pump down or pump up
- X = no floats
  WITH alarm package
  WITHOUT alarm package

OPTIONS Listed below

★ ENCLOSURE UPSIZE - If you selected 3 or more of the ★ options, or one ★★ option, a one-time enclosure upsize fee would apply.

If additional features are required, call the factory for a quote on either a SJE-Rhombus Pro-Line or Engineered Custom control panel.

CODE	DESCRIPTION
1A	Red beacon only / no audio (must select 1E if floats included)
1C	Horn only / no visual (must select 1E if floats included)
1E	Alarm float
3A	Alarm flasher
★ 3B	Manual alarm reset
★ 4A	Low level cutout (select option 4D if floats included)
★ 4B	Red low-level indicator & alarm (must select 4A also)
4D	Low-level float
★ 5A	Thermal cutout/heat sensor auto reset (for pumps w/thermal switch leads)
★★5E	Seal failure circuit & red indicator (2 wire)
6A	Auxiliary alarm contact, form C type
★ 8A	Elapsed time meter
★ 8C	Event (cycle) counter
★★9_A	Pump overload specify amperage after number 9 followed by letter "A". Example: 912A = 12 amp pump.
★★	0-25 FLA
★★	25-30 FLA
10E	Lockable latch - NEMA 4X
10E	Lockable latch - NEMA 1
★10F	Lightning arrester
★10K	Anti-condensation heater

CODE	DESCRIPTION
11C	NEMA 1 alarm panel must select option 6A
11D	NEMA 4X alarm panel must select option 6A
★★14B	Main disconnect (rotary style, mounted through door) non-fused
★★	0-20 FLA (total of both pumps)
★★	20-30 FLA (total of both pumps
15A	Control / alarm circuit breaker Does not include the circuit board as in standard.
16A	10' cord in lieu of 20' (per float)
16B	15' cord in lieu of 20' (per float)
16C	30' cord in lieu of 20' (per float)
16D	40' cord in lieu of 20' (per float)
17A	SJE SignalMaster® / mounting strap • (per float)
17B	SJE SignalMaster® / externally weighted • (per float)
17C	Sensor Float® / internally weighted ▲ (per float)
17D	Sensor Float® / externally weighted ▲ (per float)
17E	Sensor Float® Mini / pipe clamp ▲ (per float)
17F	Sensor Float® Mini / externally weighted ▲ (per float)
19T	TOA (Test/Off/Automatic) switch and pump run light through door mounted
19U	HOA (Hand/Off/Automatic) switch and pump run light through door mounted
19X	Door mounted pump run indicator
21A	Pumpmaster® in lieu of on/off switches •
21B	PumpMaster® Plus in lieu of on/off switches •
21C	Super Single® in lieu of on/off switches ▲
21D	Double Float™ in lieu of on/off switches ▲

• Mechanically-activated ▲ Mercury-activated

SAMPLE

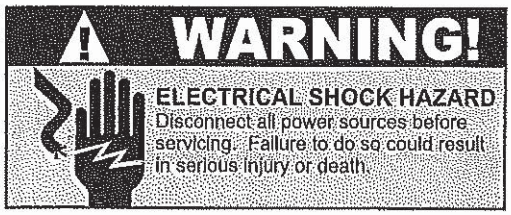
MODEL	112	1	W	9	1	4	H	3A 8A

- Alarm Package
- Enclosure Rating
- Starting Device
- Pump Full Load Amps
- Pump Disconnect
- Float Switch Application
- Options: Flasher, Elapsed Time Meter

Single Phase Simplex

SJE-Rhombus® Type 112

Installation Instructions and Operation/Troubleshooting Manual



This control panel must be installed and serviced by a licensed electrician in accordance with the National Electric Code NFPA-70, state and local electrical codes.

All conduit running from the sump or tank to the control panel must be sealed with conduit sealant to prevent moisture or gases from entering the panel. **NEMA 1 enclosures are for indoor use only,** primarily to provide a degree of protection against contact with enclosed equipment. Cable connectors are not required to be liquid-tight in NEMA 1 enclosures. **Do not use NEMA 1 enclosures if subjected to rain, splashing water or hose-directed water. NEMA 4X enclosures are for indoor or outdoor use,** primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water and hose-directed water. **Cable connectors must be liquid-tight in NEMA 4X enclosures.**

Installation

A standard Type 112 panel is designed to operate with three floats. These floats operate pump stop, pump start, and high level alarm functions.

NOTE: Options ordered may affect the number of floats and their functions. Please reference the schematic provided with the control panel for proper installation.

Installation of Floats

CAUTION: If control switch cables are not wired and mounted in the correct order, the pump system will not function properly.

WARNING: Turn off all power before installing floats in pump chamber. Failure to do so could result in serious or fatal electrical shock.

1. Use float label kit to label floats for specific operation (stop, start, alarm, etc.). See schematic for float options.
2. Determine your normal operating level, as illustrated in **Figure 1**.
3. Mount float switches at appropriate levels as illustrated in **Figures 2-4**. Be sure that floats have free range of motion without touching each other or other equipment in the basin.

If using the mounting clamp; follow steps 4-6.

4. Place the cord into the clamp as shown in **Figure 2**.
5. Locate the clamp at the desired activation level and secure the clamp to the discharge pipe as shown in **Figure 2**.

   NOTE: Do not install cord under hose clamp.
6. Tighten the hose clamp using a screwdriver. Over tightening may result in damage to the plastic clamp. Make sure the float cable is not allowed to touch the excess hose clamp band during operation.

   NOTE: All hose clamp components are made of 18-8 stainless steel material. See your SJE-Rhombus® supplier for replacements.

Warranty void if panel is modified.

Call factory with servicing questions:

1-800-RHOMBUS
(1-800-746-6287)

Manufactured by:

SJE Rhombus®

22650 County Highway 6 ■ P.O. Box 1708
Detroit Lakes, Minnesota 56502 USA
1-888-DIAL-SJE (1-888-342-5753)
Phone: 218-847-1317 ■ Fax: 218-847-4617
E-mail: customer.service@sjerhombus.com
Website: www.sjerhombus.com

PN1008704E • Rev 11/14

Installation Instructions

Mounting the Control Panel

1. Determine mounting location for panel. If distance exceeds the length of either the float switch cables or the pump power cables, splicing will be required. For outdoor or wet installation, we recommend the use of an SJE-Rhombus® liquid-tight junction box with liquid-tight connectors to make required connections. **You must use conduit sealant to prevent moisture or gases from entering the panel.**

2. Mount control panel (mounting flanges are furnished with control panel).

3. Determine conduit entrance locations on control panel. Check local codes and schematic for the number of power circuits required.

   NOTE: Be sure the proper power supply voltage, and phase are the same as the pump motor being installed. If in doubt, see the pump identification plate for electrical requirements.

4. Drill proper size holes for type of connectors being used.

   NOTE: If using conduit, be sure that it is of adequate size to pull the pump and switch cables through. **You must use conduit sealant to prevent moisture or gases from entering the panel.**

5. Attach cable connectors and/or conduit connectors to control panel.

   FOR INSTALLATION WITHOUT A SPLICE, GO TO STEP 11; FOR INSTALLATION REQUIRING A SPLICE, FOLLOW STEPS 6-10.

6. Determine location for mounting junction box according to local code requirements. **Do not** mount the junction box inside the sump or basin.

7. Mount junction box to proper support.

8. Run conduit to junction box. Drill proper size holes for the type of conduit used. Attach liquid-tight connectors to junction box.

9. Identify and label each wire before pulling through conduit into control panel and junction box. Pull pump power cables and control switch cables through connectors into junction box. Make wire splice connections at junction box.

10. Firmly tighten all fittings on junction box. Insure all cable connectors are liquid-tight and sealed.

11. If a junction box is not required, identify and label cables on both float and stripped ends.

12. Connect pump and float wires to proper position on terminals. See schematic inside control panel for terminal layouts.

13. Connect control, alarm and pump power conductors to proper position on terminals. See schematic inside control panel for terminal connections.

    NOTE: It is the recommendation of the factory to use separate pump and control/alarm power sources.

VERIFY CORRECT OPERATION OF CONTROL PANEL AFTER INSTALLATION IS COMPLETE.

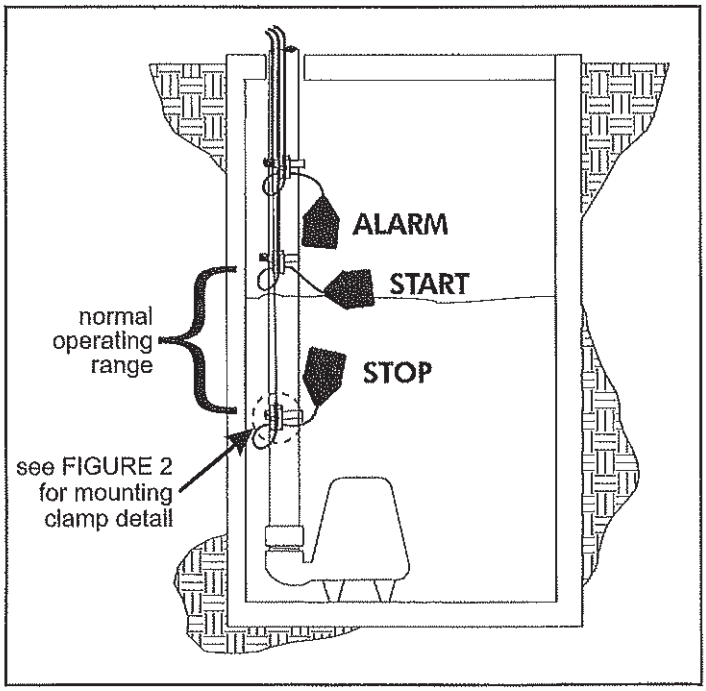


FIGURE 1-
Three float simplex - pump down installation

SINGLE PHASE SIMPLEX - 112

Standard Field Wiring Diagram

Identifty panel configuration before wiring. Use wiring diagram in conjunction with schematic for panel installation.
NOTE: It is the recommendation of the factory to use separate pump and alarm power sources.

⚠ WARNING!

ELECTRICAL SHOCK HAZARD
Disconnect all power sources before servicing. Failure to do so could result in serious injury or death. Must be installed by a licensed electrician and in accordance with the National Electric Code NFPA-70, state and local electrical codes.

1 Wire Floats

a. Connect float switches to TB1 (on circuit board) as shown.
(Pump down application is shown)

2 Wire pump power cable

a. Connect pump power cable to motor contactor.
b. Connect pump ground wire to ground lug.

3 Wire incoming control & alarm power

Control and Alarm on circuit board

a. Connect L1 (alarm) to TB1-1.
b. Connect L1 (control) to TB1-2.
c. Connect Neutral to TB1-3.
d. Connect incoming ground line to ground lug.

Figure A
No Breaker - 120/208/240V

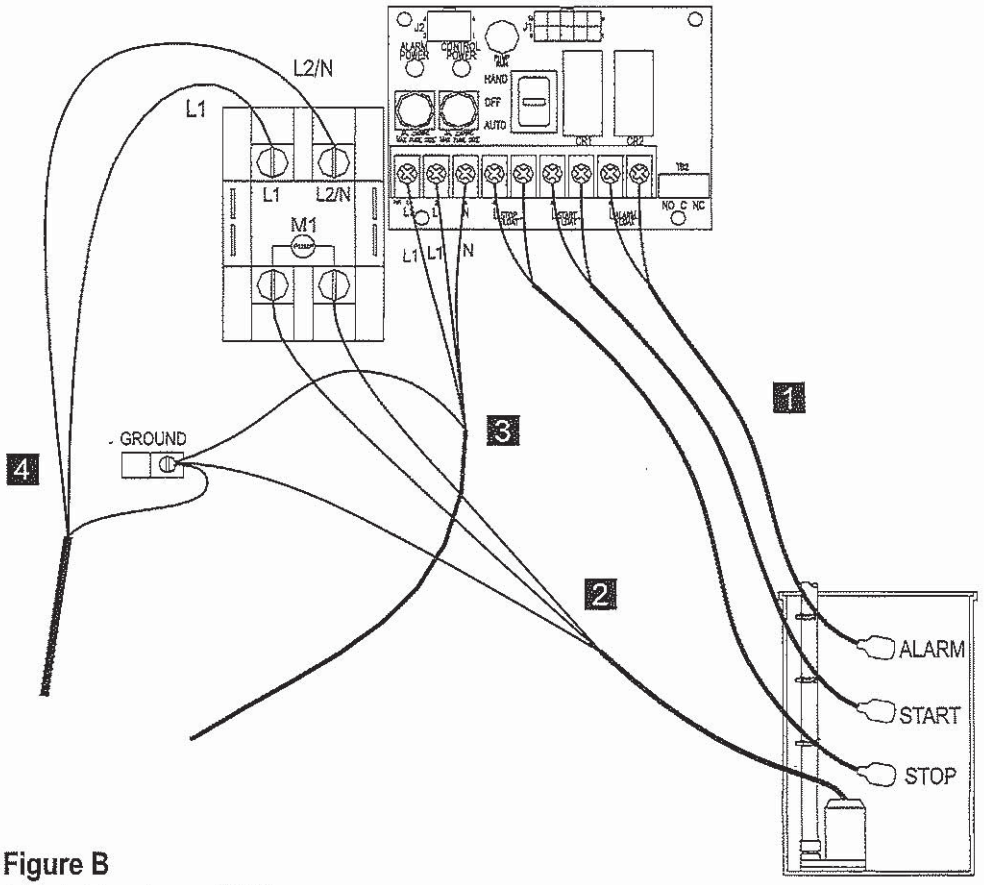
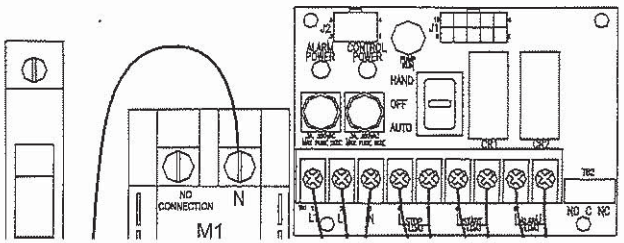
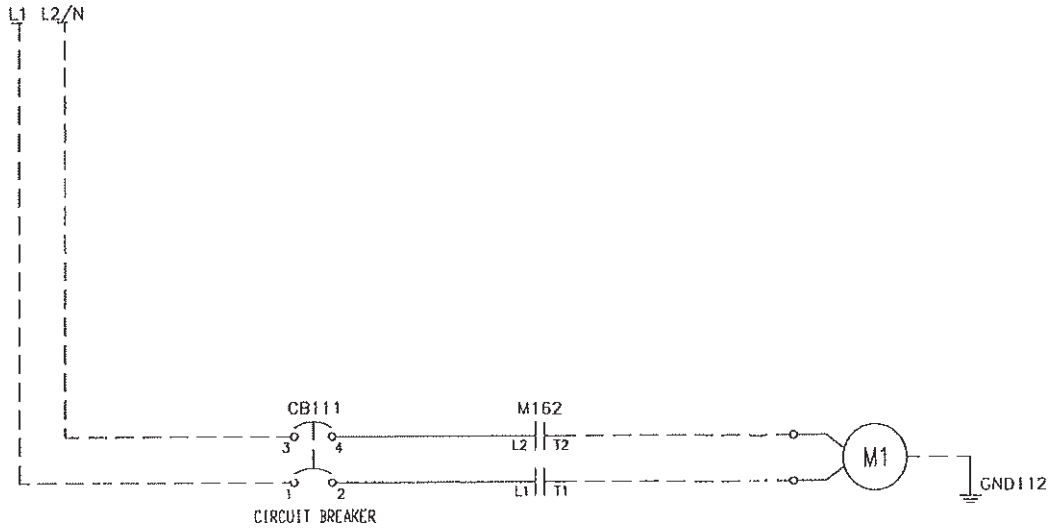
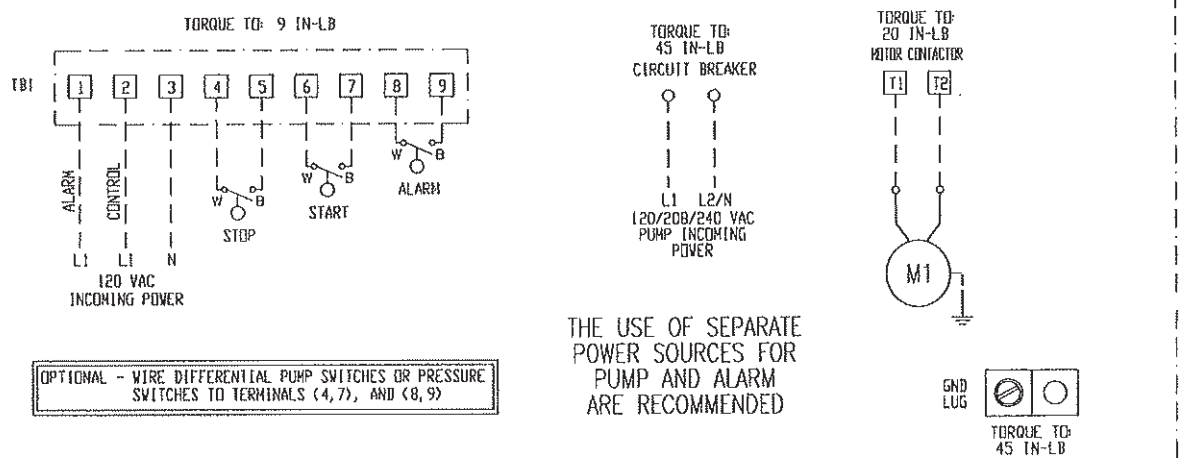


Figure B
1 Pole Breaker - 120V




L1
L2/N
CB111
M162
3
4
L2
T2
M1
GND112
1
2
L1
T1
CIRCUIT BREAKER


TORQUE TO: 9 IN-LB
TB1
1
2
3
4
5
6
7
8
9
ALARM
CONTROL
W
B
STOP
START
ALARM
L1
L1
N
120 VAC
INCOMING POWER
TORQUE TO:
45 IN-LB
CIRCUIT BREAKER
L1
L2/N
120/208/240 VAC
PUMP INCOMING
POWER
TORQUE TO:
20 IN-LB
MOTOR CONTACTOR
T1
T2
M1
OPTIONAL - WIRE DIFFERENTIAL PUMP SWITCHES OR PRESSURE SWITCHES TO TERMINALS (4,7), AND (8,9)
THE USE OF SEPARATE POWER SOURCES FOR PUMP AND ALARM ARE RECOMMENDED
GND LUG
TORQUE TO:
45 IN-LB
OVERLOAD PROTECTION, MAIN DISCONNECT AND OVERCURRENT PROTECTION OF INCOMING FEEDER CIRCUIT PROVIDED BY OTHERS AND MUST BE SIZED ACCORDING TO PUMP/MOTOR MANUFACTURING SPECIFICATIONS
BRANCH CIRCUIT PROTECTION FOR THE CONTROL AND ALARM CIRCUITS MUST BE PROVIDED BY THE INSTALLER. AN INVERSE TIME CIRCUIT BREAKER NOT TO EXCEED 20 AMPS IS REQUIRED.
TEMPERATURE RATING OF FIELD INSTALLED CONDUCTORS MUST BE AT LEAST 140 DEG. F. (60 DEG. C.). TERMINAL STRIPS AND GROUND LUG USE COPPER CONDUCTORS ONLY.
CONNECT GROUND LUG IN PANEL TO A SECURE EARTH GROUND
DASHED LINES REPRESENT FIELD WIRING
FIELD WIRING SECTION

278 Nomore Lane
Montreal, MO 65591
P: 573-317-9620

Material Submittal Request

Project Name: [illegible]

Engineer: [illegible]

Project Number: 2721[illegible]218[illegible]01

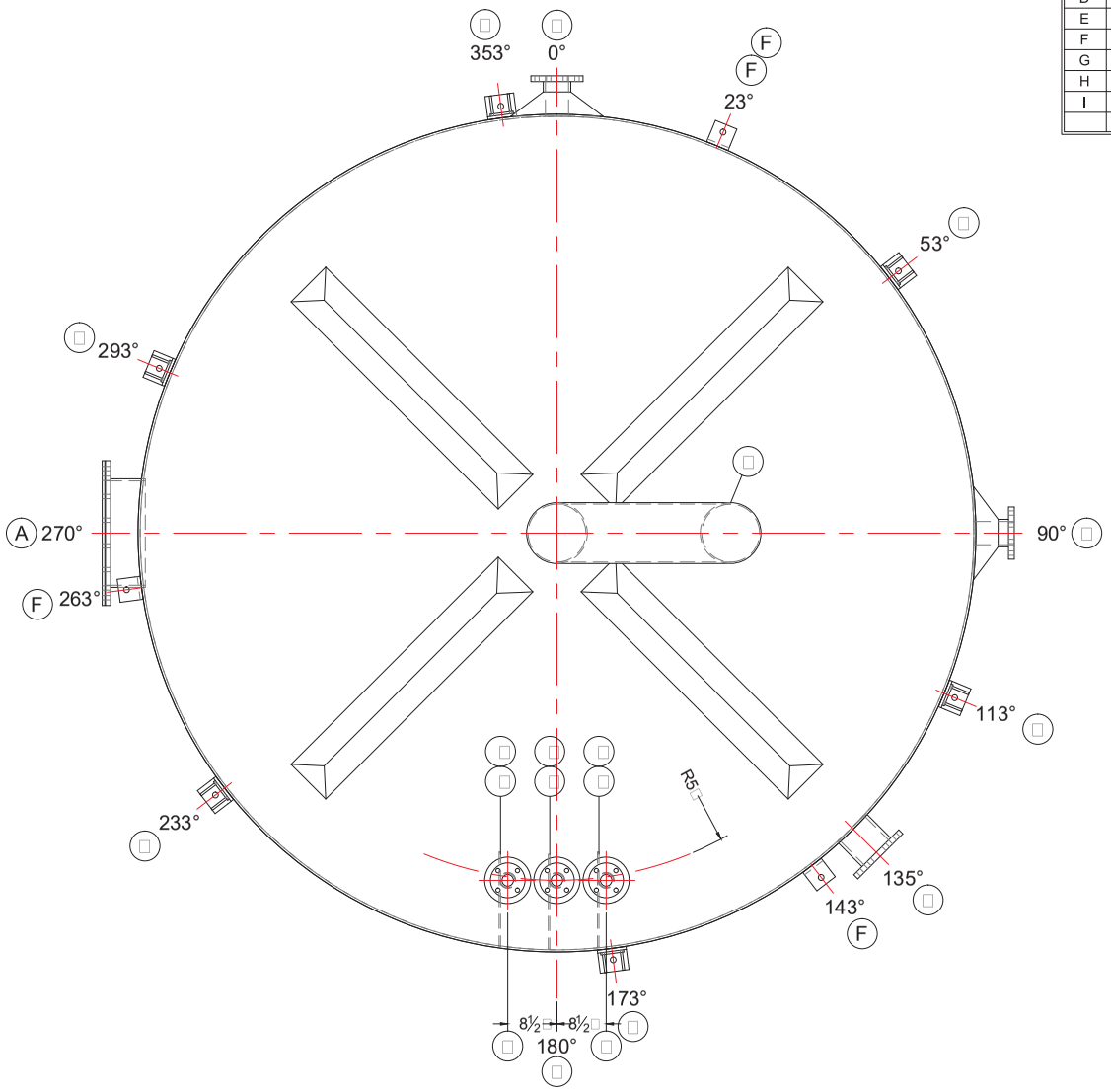
Product: [illegible]

Date: 06/23/2017

Revision: 00

Supplier		Manufacturer	
Company Name:	Advanced Fluid Technologies	Company Name:	Fiberglass Tank Solutions
Street Address:	7801 Warden Road	Street Address:	278 Nomore Lane
City/State/Zip:	Sherwood, AR 72120	City/State/Zip:	Montreal, MO 65591
Phone:	501-835-3200	Phone:	573-317-9620
Fax:		Fax:	

Tank Drawings



TANK 1 - BOM

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG./RAD
A	1	18" SIDE MANWAY W/ COVER, EPDM GASKET & SS 316 BOLTS	MANWAY	3'-0" CL	270°
B	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 2	1'-8" CL	90°
C	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 3	1'-8" CL	0°
D	1	6" FLANGE NOZZLE	CLEAN OUT	1'-0" CL	135°
E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG
H	3	2" FLANGE NOZZLE W/ CONICAL GUSSETS & FRP DOWN PIPES	FILL LINES	TOP	5'-0" RAD
I	6	FIBERGLASS PIPE SUPPORT BRACKETS	PIPE SUPPORT	SEE DWG	180°

N RAL NOT S

1. FLAN S AR R LL RANS 16.5 LASS 150 RAT FOR 50 S OLT OL S TO STRA L N RN L TAN NT RL N S NO L L S TO RO T 5 NL SS OT RW S NOT ALL FLAN S AN SMALL R W LL LAT SS T N N NT S ORTS FOR ALL N LOA S TO S L L OT RS A O STRA N ON F R LASS F TT N S AN S S F L L ONN T ONS W R OSS L
2. NO L S RO T 2 NTO TAN
3. SS L TO A OM L T OTTOM S ORT S STOM R F R LASS TAN SOL T ONS R OMM N S T AT A TAN WAT R F LL RO T ST FOR A 2 O R R O AFT R T TAN S INSTALL
5. TAN OL WNS M ST S R L FAST N TO FLOOR
6. RO R NTN M ST T L F NT S R N S AR R S NT S N O L T AN A L
7. TAN S S N FOR ATMOS R R SS R STORA ONL FA L R TO O S R T S O L R S LT N TAN FA L R AN O TAN WARRANT O NOT NT R TAN NL SS F RAL STAT O S A TAN NTR RO R S A FOLLOW
9. O NOT LO AT AN OR OLTS N TAN A FOR R T OF TAN F R LASS TAN SOL T ONS W LL NOT R S ONS L FOR R S TAN OR OLTS
10. ALL L TR AL AN M AN AL ONN T ONS O T RS
11. ALL OLTS AS TS AN AN OR OLTS O T RS NL SS OT RW S NOT
12. T RNAL T L OAT TO S ML M N M MT N SS NO F L L A NT RO FTS
13. ALL M AS ONS AR N N S NL SS OT RW S NOT
14. AN T N NOT L ST ON T S RAW N S NOT RO FTS
15. F R LASS TAN SOL T ONS W LL FA R AT R T F NAL FTS RT F RAW N T S T R W N A T OR T S R S ONS L T TO R W T RAW N TO ASS R A RAT L A M N T OF R RA S L L AT ON T OF T MS L ST FOR T TAN
16. WARRANT W LL O FOR NON A M NT OR LAT A M NT

WARN N

1. SS L M ST R TL NT TO ATMOS R R SN A OS N OR M S ROOM NT AN NT M ST NOT ONN T TO A F M OLL T ON S ST M SS L M ST W T AN O RFLOWW M S T NOT S AR N LO WT SL AN MAL N STS T AN O RFLOW O N AR AS M ST OM N AR AS OF ALL O TL TS N WORST AS S T ON T ON F A T ONAL NO L S AR A NSTR T T NOT TO LOS ASS, R STR T, OR ALT R AN A O RFLOW S ST MS FAL R TO FOLLOW T S RO O L R S LT N TAN L A A S LLS OR ATASTRO FA L R
2. L AS R A F R LASS TAN SOL T ONS AN L N AN INSTALLAT ON NSTR T ONS AR F LL FA L R TO OM L W T NSTR T ONS MA AMA TAN AN W LL O S T WARRANT

TAN A	12-0
TAN ST WALL	12-6
TAN TO	OM
TAN OTTOM	FLAT
TAN T N S S	S LAM NAT ON S N S
NO R	1
SS L ONT NT	L A AT
SS L A A T	10,576 NOMINAL ALLONS
STMAT M T W T	2,600 L S
OLT N MAT RAL	316 S S
AS TMAT RAL	M
T S RFA OLOR	RA
S N O	ASTM-3299
S F R A T	1.0
S N R S R	ATMOS R
S N T M RAT R	120° (F)
S SM LOA N	
W N LOA N	
LN R L	N S
LN RR S N	TRON 922
TOTAL L N RT S N SS	120 M L M N M M
STR T R T	FLAM NT WO N
STR T R R S N	
ATAL ST S ST M	M
NO L RAT N	50 S
S A T	ASTM-2563
AR OL T ST	ASTM-2583
RN T ST	ASTM-258
ROT ST	NON
OST R	NON
NO L TO TS	NON

APPROVAL NEEDED

L AS SUCH NO L LO AT ONS AN M AS R N M NTSS OWN NOT ALL W S N R AN R T RN RNT S N N A RO AL T S S N A R M NT AT ALL AN S AR OM L T AN FINAL S STOM R

A RO WT NO AN S

A RO WT R S ONS

NOTA RO R S M T

A RO

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TAN 1 LAN W

RO T

CLOSURE OF INACTIVE NABORS LANDFILLS

MOUNT HOME, AR

NAW AT	NAW	T S
06/21/2017	MATT	

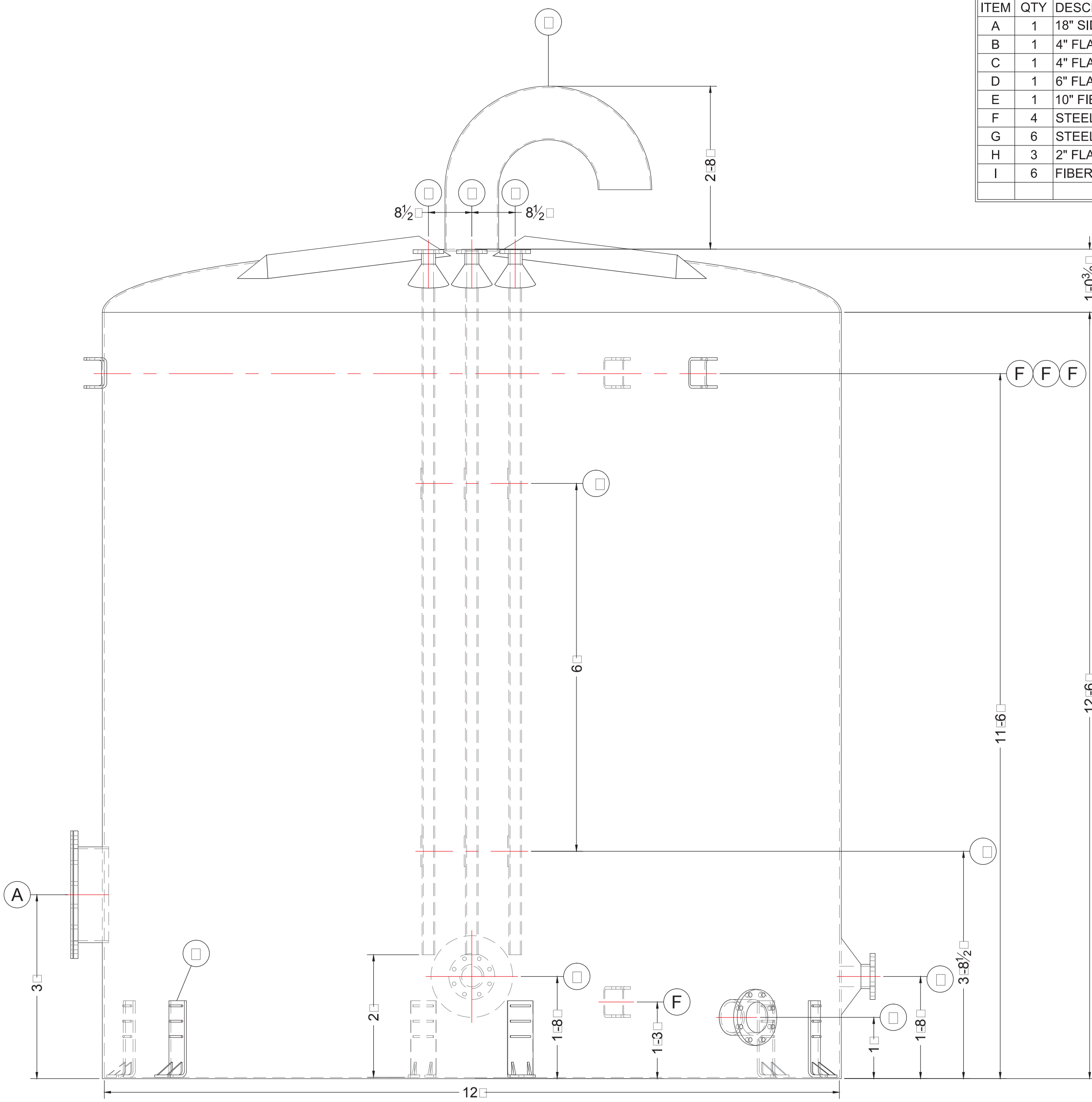
Fiberglass Tank Solutions

278 Nomore Lane, Montreal, MO 65591

573-317-9620

TANK 1 - BOM

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG./RAD
A	1	18" SIDE MANWAY W/ COVER, EPDM GASKET & SS 316 BOLTS	MANWAY	3'-0" CL	270°
B	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 2	1'-8" CL	90°
C	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 3	1'-8" CL	0°
D	1	6" FLANGE NOZZLE	CLEAN OUT	1'-0" CL	135°
E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG
H	3	2" FLANGE NOZZLE W/ CONICAL GUSSETS & FRP DOWN PIPES	FILL LINES	TOP	5'-0" RAD
I	6	FIBERGLASS PIPE SUPPORT BRACKETS	PIPE SUPPORT	SEE DWG	180°



	12-0
	12-6
	FLAT
	1
	10,576 NOMINAL GALLONS
	2,600 LBS
	316 SS
	ASTM-3299
	1.0
	ATMOSPHERIC
	120° (F)
	TRON 922
	120 MIL MINIMUM
	FILAMENT WOUND
	50 PSI
	ASTM-2563
	ASTM-2583
	ASTM-2583
	NONE
	NONE
	NONE

WARNING

APPROVAL NEEDED

- [ ] APPROVED WITH NO CHANGES
- [ ] APPROVED WITH REVISIONS
- [ ] NOT APPROVED, RESUBMIT

APPROVED BY: ____________

DATE: ____________

REV	REV DATE
00	00/00/0000

TANK 1 ELEVATION VIEW

CLOSURE OF INACTIVE NABORS LANDFILLS
MOUNT HOME, AR

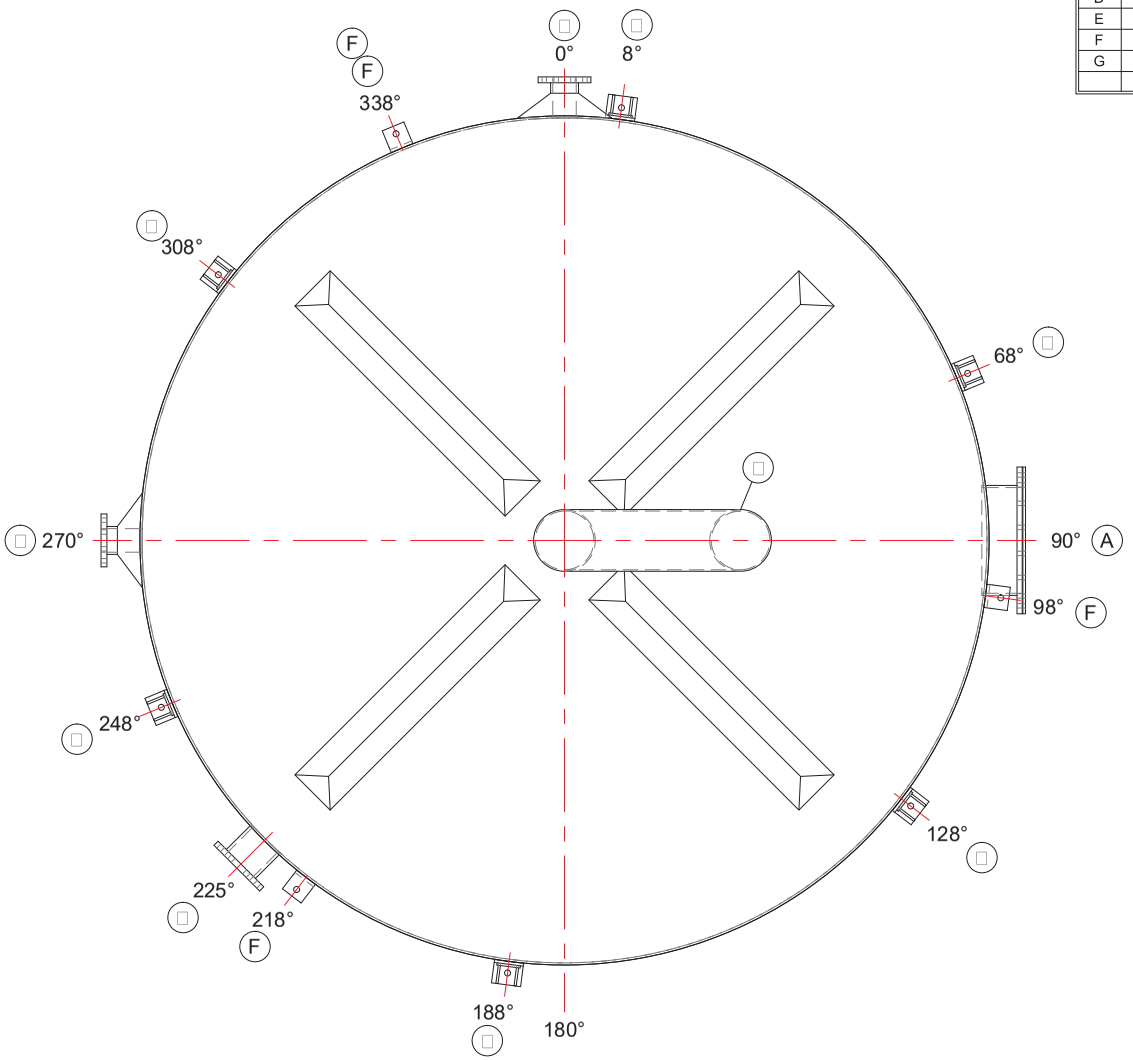
DRAWN DATE	DRAWN BY
06/21/2017	MATT

Fiberglass Tank Solutions

278 Nomore Lane, Montreal, MO 65591
573-317-9620

TANK 2 - BOM

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG.
A	1	18" SIDE MANWAY W/ COVER, EPDM GASKET & SS 316 BOLTS	MANWAY	3'-0" CL	90°
B	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 1	1'-8" CL	270°
C	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 4	1'-8" CL	0°
D	1	6" FLANGE NOZZLE	CLEAN OUT	1'-0" CL	225°
E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG



TAN□□A□	12□0□
TAN□□ST□WALL□	12□6□
TAN□□TO□□	□OM□
TAN□□OTTOM□□	FLAT
TAN□□T□□□N□SS□	S□□□LAM□NAT□ON S□□□□□N□□S
NO.R□□□□	1
□SS□L□□ONT□NT□	L□A□□AT□□
□SS□L□□A□A□T□□	10,576 NOMINAL□□ALLONS
□STMAT□□□M□T□□W□□□T□	2,600 L□S
OLT□N□□MAT□RAL□	316 S S□
□AS□□TMAT□RAL□	□□□M
□T□S□RFA□□OLOR□	□RA□
□S□N□□O□□□	ASTM-□-3299
S□□□F□□□RA□T□□	1.0
□S□□N□R□SS□R□□	ATMOS□□□R□
□S□N□T□M□□RAT□R□□	120° (F)
S□□SM□□LOA□□N□□	
W□N□□LOA□□N□□	
LN□R□□L□	N□□□S
LN□RR□SN□	□□TRON 922□□□
TOTAL□LN□RT□□□N□SS□	120 M□L M□N M□M
STR□□T□R□T□□□□	FLAM□NT□WO□N□
STR□□T□R□R□S□N□	□□
□ATAL□ST□S□T□M□	M□□□
NO□□L□□RAT□N□□	50□□S□
□S□A□□□T□	ASTM-□-2563
AR□OL□T□ST□	ASTM-□-2583
□RN□T□ST□	ASTM-□-258□
□□ROT□ST□	NON□
OST□□R□□	NON□
NO□□L□□□TO□TS□	NON□

□□N□RAL NOT□□S□

1.□ FLAN□□S AR□□□R LL□□□□R ANS□□16.5□□LASS 150 RAT□□□FOR 50□□S□□□OLT□□OL□S TO STRA□□L□□□□R N□□L□TAN□□□NT□RL N□S□NO□□L□S TO□RO□□T 5□□NL□SS OT□□RW S□NOT□□□ALL FLAN□□S□□AN□SMALL□R W LL□□□□LAT□□□SS□T□□□□ N□□□□N□□NT S□□□ORTS FOR ALL□□□N□□LOA□S TO□□□S□□□L□□□□OT□□RS□□ A□O□□□□□STRA N ON F□□R□LASS F TT N□SAN□□S□FL□□□L□□□ONN□□T ONS W□□R□□OSS□L□□

2.□ NO□□L□S□RO□□T 2□NTO TAN□□

3.□ □□SS□L TO□A□□□OM L□T□□OTTOM S□□□ORT□□□□STOM□R□

4.□ F□□R□LASS TAN□SOL□T ONS R□□OMM□N□S□T AT□A□□TAN□□□WAT□R F LL□□ □□□RO□T□ST□□□FOR A 2□□O□R□□R O□AFT□R T□□TAN□□S□NSTALL□□□

5.□ TAN□□OL□□OWNS M□ST□□S□□□R L□FAST N□□TO FLOOR□

6.□ RO□□R□□NT N□□M□ST□□□T L□□□□F□□NT S□R□□N SAR□□□R S□NT T□□□ S□O□L□□□□□□T□L□AN□A L□□

7.□ TAN□□S□□S□□N□□FOR ATMOS□□□R□□□R□SS□R□□STORA□□□ONL□□FA L□R□TO O□S R□□□T□S□O□L□R□S□LT□N TAN□FA L□R□AN□□O□□TAN□WARRANT□□

8.□ □O NOT□NT R TAN□□□NL SS F□□□RAL□STAT□O S□□A□TAN□□NTR□□RO□□□□R□S □A□□□□N FOLLOW□□□

9.□ □O NOT LO□AT□AN□□OR□□LTS N TAN□□A□□□FOR□R□□□□T OF TAN□□□ F□□R□LASS TAN□SOL□T ONS W LL NOT□□R□S ONS□□L□FOR□R S□TAN□□OR □OLTS□

10. ALL□□L□□TR□□AL AN□M□□□AN□AL□ONN□□T ONS□□□OT□□RS□

11. ALL□OLTS□□AS□□TS AN□□AN□□OR□OLTS□□□OT□□RS□NL SS OT□□RW S□NOT□□□

12. □□T RN AL□□L□OAT TO□□S M L M N M□MT□□□N SS NO F□L□□A NT□□ □RO□□□□□FTS□

13. ALL□□M AS ONS AR□N N□□□S□NL SS OT□□RW S□NOT□□□

14. AN□T□N□NOT L ST□□ON T□S□RAW N□□S NOT□RO□□□□□□FTS□

15. F□□R□LASS TAN□SOL□T ONS W LL FA R□AT□□□RT□□F NAL FTS□□RT F□□□ RAW N□□T S T□□R□□W N□A□T□OR T□S R□S ONS□L T□TO R□□□WT□□ RAW N□TO ASS□R□A□□RAT□□L A□□M□NT OF□□R□□RA□□S,□L□AT ON, □T□□OF□T M S L ST□□FOR T□□TAN□□

16. WARRANT□WLL□□□O□□□FOR NON A□M□NT OR LAT□□A□M□NT□

WARN N□□

1.□ □□SS□L M□ST□□□R□TL□□NT□□TO ATMOS□□□R□□S N□A□OOS N□□□OR M□S□ROOM□□NT AN□□NTM□ST NOT□□□ONN□□T□□TO A F M□□OLL□□T ON S□ST M□□SS□L M□ST□□□□□□□WT□AN O□RFLOWW□□□M□ST NOT□□□ S□□AR□□□□N□RL□□□OR□ONN□T□□TO A□□N□S□ST MW□□M□□T□□ LO□□□WT□□□S,L□□□AN MAL N□STS,□T□□NT AN□O□RFLOW O□N AR AS M□ST□□□□□□OM□N□□AR AS OF ALL O□TL TS□N WORST□AS□□S□T ON□T ON□FA□□TONAL NO□□L S AR□A□□□□□NSTR□T□□NOT TO□LOS□, □□ASS R STR□T OR ALT R□□NT AN□O□RFLOW S□ST MS FAL R□TO FOLLOW T□S□RO□□□R□□O□L□R S□LT N TAN□L A□A□□S□LLS OR □ATASTRO□□□FAL R□□

2.□ □L AS□R A□F□□R LASS TAN□SOL□T ONS□AN□L N□AN□INSTALLAT ON INSTR□□T ONS□AR F LL□FAL R□TO□OM L□W T□INSTR□□T ONS MA□□AMA□□ TAN□AN□W LL□O□T□□WARRANT□□

R□□□	R□□□AT□□
00	00/00/0000
S□TTL□	TAN□□2□□LAN□□□□W
RO□□T	CLOSURE OF INACTIVE NABORS LANDFILLS MOUNT HOME, AR
NAW□AT□	NAW□
06/21/2017	MATT

APPROVAL NEEDED

L AS□□□□NO□L LO AT ONS AW M AS R N M NTS S OWN NOT ALL □W□S N R□□AN R T RN RNT□□S N N A RO AL T S S N A R□M N T AT ALL□AN□S AR□OM L T AN FNAL□□□STOM R□

☐ A□RO□□□WT□R□S ONS

☐ A□RO□□□WT□R□S ONS

☐ NOTA□RO□□□R S□M T

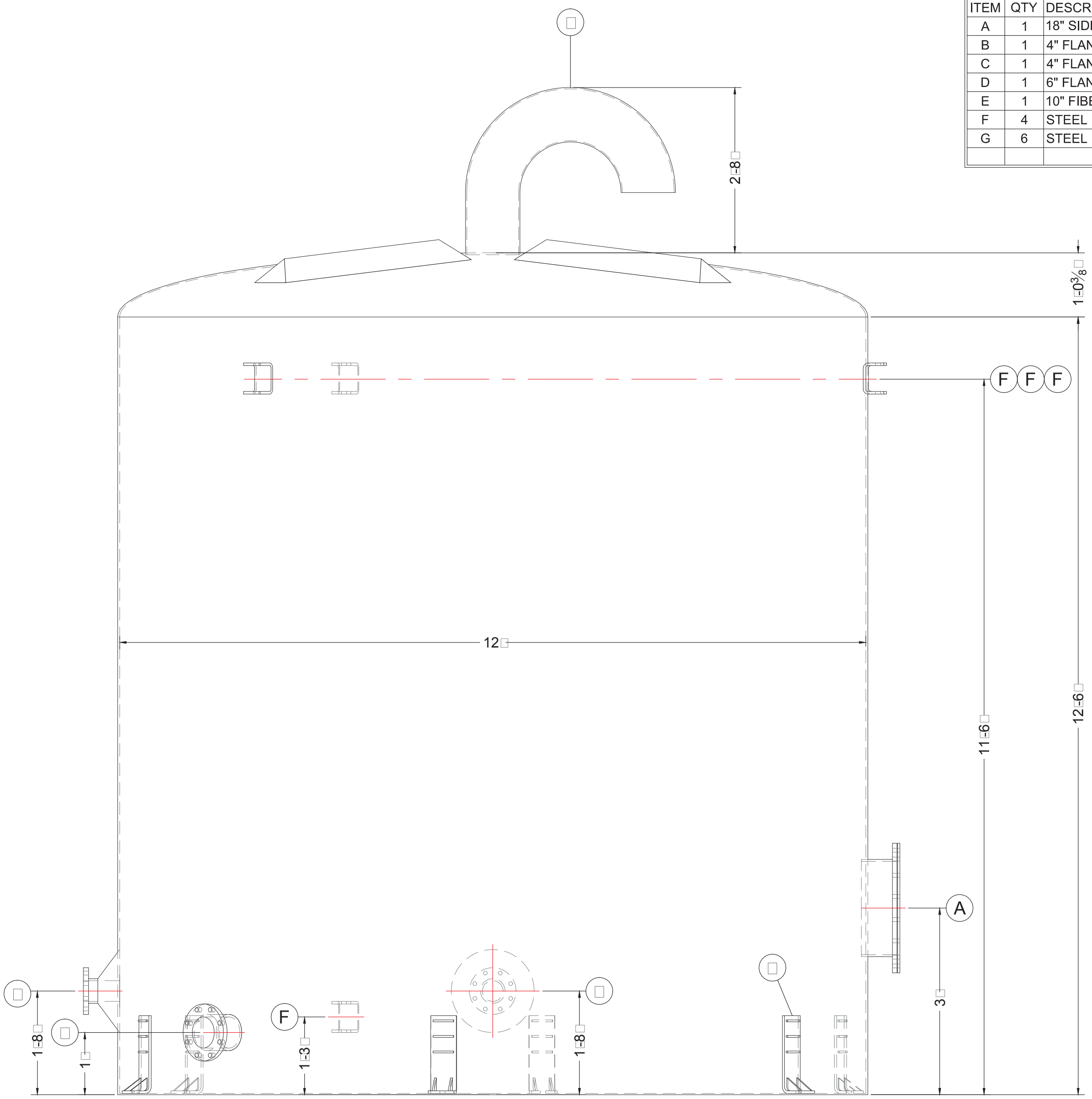
A□RO□□□□□□ _____

□AT□□ _____

Fiberglass Tank Solutions

278 Nomore Lane, Montreal, MO 65591

□□573-317-9620



TANK 2 - BOM

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG.
A	1	18" SIDE MANWAY W/ COVER, EPDM GASKET & SS 316 BOLTS	MANWAY	3'-0" CL	90°
B	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 1	1'-8" CL	270°
C	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 4	1'-8" CL	0°
D	1	6" FLANGE NOZZLE	CLEAN OUT	1'-0" CL	225°
E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG

□□N□RAL NOT□S□

1□ FLAN□□S AR□ □R□LL□□ □□ R ANS□ □16□5 □LASS 150 RAT□□ FOR 50□□S□ □OLT □OL□S TO STRA□□L□ □□□R N□□L□ TAN□ □□NT□RL□N□S□ NO□□L□S TO □RO□□□T 5□ □NL□SS OT□□RW□S□ NOT□□□ ALL FLAN□□S □□AN□ SMALL□R W□LL □□□ □LAT□ □ □SS□T□□□ □N□□□□N□□NT S□□□ORTS FOR ALL □□□N□ LOA□S TO □□S□□□L□□□□OT□□RS□ A□O□□□□□ STRA□N ON F□□□R□LASS F□TT□N□S AN□ □□S□FL□□□L□□ONN□□T□ONS W□□R□ □OSS□L□□
2□ NO□□L□S □RO□□□T 2□ □NTO TAN□□
3□ □□SS□L TO □A□□ □OM□L□T□ □OTTOM S□□□ORT □□□□ □STOM□R□
□□ F□□R□LASS TAN□ SOL□T□ONS R□□OMM□N□S T□AT □A□□ TAN□ □□ WAT□R F□LL□□ □□□□RO□T□ST□□□ FOR A 2□□O□R □□R□O□ AFT□R T□□ TAN□ □S □NSTALL□□□
5□ TAN□ □OL□ □OWNS M□ST □□ S□□□R□L□ FAST□N□□ TO FLOOR□
6□ □RO□□R □□NT□N□ M□ST □□ □T□L□□□□ □F □□NT□S □R□□NS AR□ □R□S□NT□T□□□ S□O□L□□□□□□□T□L□AN□ □A□L□□
7□ TAN□□S □□S□□N□□ FOR ATMOS□□□R□□ □R□SS□R□ STORA□□ ONL□□ FA□L□R□ TO O□S□R□□T□□S □O□L□ R□S□LT □N TAN□ FA□L□R□ AN□ □O□ TAN□ WARRANT□□
8□ □O NOT □NT□R TAN□ □NL□SS F□□□RAL □ STAT□ O□S□ □A TAN□ □NTR□ □RO□□□□R□S □A□□□□□□N FOLLOW□□□
9□ □O NOT LO□AT□ AN□□OR □OLTS □N TAN□ □A□□□ FOR □R□□□□T OF TAN□□ F□□R□LASS TAN□ SOL□T□ONS W□LL NOT □□ R□S□ONS□□L□ FOR □R□S□T AN□□OR □OLTS□
10□ ALL □L□□TR□AL AN□ M□□□AN□AL □ONN□□T□ONS □□□OT□□RS□
11□ ALL □OLTS, □AS□□TS, AN□ AN□□OR □OLTS □□OT□□RS □NL□SS OT□□RW□S□ NOT□□□
12□ □□T□RNAL □□L□OAT TO □□5 M□L M□N□M□M T□□□N□SS NO F□L□□A NT□□ □RO□□□□□□□FTS□
13□ ALL □□M□NS□ONS AR□ □N □N□□□S □NL□SS OT□□RW□S□ NOT□□□
1□□ AN□T□□N□ NOT L□ST□□ ON T□□S □RAW□N□ □S NOT □RO□□□□□□□□FTS□
15□ F□□R□LASS TAN□ SOL□T□ONS W□LL FA□R□ AT□ □□R T□□ F□NAL FTS□ □RT F□□ □RAW□N□ □T□S T□□R□□□W□N□A□T□OR T□S R□S□ONS□□L□T□ TO R□□□□W T□□ □RAW□N□ TO ASS□R□ A□□□RAT□ □LA□□M□NT OF □□□R□□, □RA□□S, □L□□AT□ON, □T□□ □OF □T□MS L□ST□□ FOR T□□ TAN□□
16□ WARRANT□ W□LL □□□ O□□□ FOR NON□A□M□NT OR LAT□ □A□M□NT□

WARN□N□□

1□ □□SS□L M□ST □□□□ R□□TL□ □□NT□□ TO ATMOS□□□R□□S□N□□A□ □OOS□N□□□□OR M□S□ROOM □□NT, AN□ □□NT M□ST NOT □□ □ONN□□T□□ TO A F□M□ □OLL□□T□ON S□ST□M □□SS□L M□ST □□□□□□□□□□□ W□T□ AN O□□RFLOW W□□□□ M□ST NOT □□ □□S□□AR□□□□ □N□□R L□□□□□□OR □ONN□□T□□ TO A □□□N□ S□ST□M W□□□□ M□□ □T□□ □LO□□□□□ W□T□ □□□, SL□□□□, AN□MAL N□STS, □T□□ □ □NT AN□ O□□RFLOW O□□N AR□AS M□ST □□□□□□□□ □OM□N□□□AR□AS OF ALL O□TL□TS □N WORST□□AS□ □□S□T □ON□□T□ON □□F A□□□T□ONAL NO□□L□S AR□ A□□□□, □□□NSTR□□T□□ NOT TO □LOS□, □□□ASS, R□STR□□T, OR ALT□R □□NT□N□ AN□ O□□RFLOW S□ST□MS □FA□L□R□ TO FOLLOW T□□S □RO□□□□R□ □O□L□ R□S□LT □N TAN□ L□A□A□□, S□□LLS OR □ATASTRO□□□□ FA□L□R□□
2□ □L□AS□ R□A□ F□□R□LASS TAN□ SOL□T□ONS □AN□L□N□ AN□ □NSTALLAT□ON □NSTR□□T□ONS □AR□F□LL□ FA□L□R□ TO □OM□L□ W□T□ □NSTR□□T□ONS MA□ □AMA□□ TAN□ AN□ W□LL □O□□T□□ WARRANT□□

TAN□ □□A□	12'-0"□
TAN□ ST□WALL□	12'-6"□
TAN□ TO□□	□OM□
TAN□ □OTTOM□	FLAT
TAN□ T□□□□N□SS□	S□□ LAM□NAT□ON S□□□□□N□□S
NO□ R□□□□□	1
□□SS□L □ONT□NT□	L□A□□AT□
□□SS□L □A□A□T□□	10,576 NOM□NAL □ALLONS
□ST□MAT□□ □M□T□ W□□□□T□	2,600 L□S
□OLT□N□ MAT□R□AL□	316 S□S□
□AS□□T MAT□R□AL□	□□□M
□□T□S□RFA□□ □OLOR□	□RA□
□□S□□N □O□□□	ASTM-□-3299
S□□□F□□ □RA□□T□□	1□0
□□S□□N □R□SS□R□□	ATMOS□□□R□□
□□S□□N T□M□□RAT□R□□	120° (F)
S□□SM□□ LOA□□N□□	
W□N□ LOA□□N□□	
L□N□R □□□L□	N□□□S
L□N□R R□S□N□	□□TRON 922□□
TOTAL L□N□R T□□□□N□SS□	120 M□L M□N□M□M
STR□□T□R□ T□□□□□	F□LAM□NT WO□N□
STR□□T□R□ R□S□N□	□□
□ATAL□ST S□ST□M□	M□□□
NO□□L□ RAT□N□□□	50 □□S□
□S□A□□□□T□	ASTM-□-2563
□AR□OL T□ST□	ASTM-□-2583
□□RN T□ST□	ASTM-□-258□
□□□ROT□ST□	NON□
□OST□□R□□	NON□
NO□□L□ □□TO□TS□	NON□

APPROVAL NEEDED

- [ ] A□□RO□□□ W□T□ NO □□AN□□S
- [ ] A□□RO□□□ W□T□ R□□□S□ONS
- [ ] NOT A□□RO□□□ R□S□□M□T

A□□RO□□□□□□: ____________________

□AT□: ____________________

R□□□	R□□□□AT□
00	00/00/0000

TAN□2□L□□AT□ON□□W

CLOSURE OF INACTIVE NABORS LANDFILLS

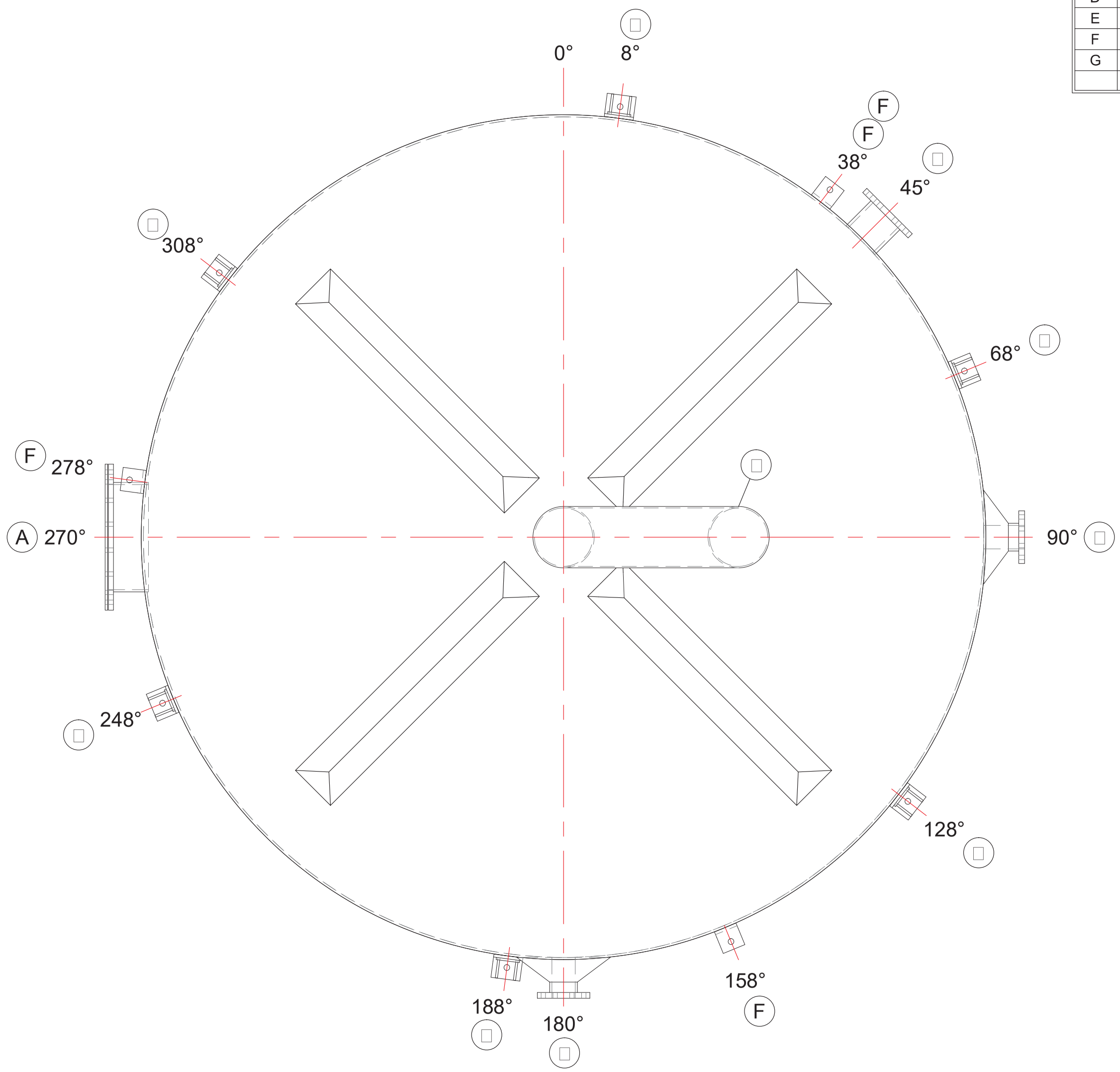
MOUNT HOME, AR

□RAWN □AT□	□RAWN □□	S□□□T S□□□
06/21/2017	MATT	□

Fiberglass Tank Solutions
278 Nomore Lane, Montreal, MO 65591
□□573-317-9620

TANK 3 - BOM

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG.
A	1	18" SIDE MANWAY W/ COVER, EPDM GASKET & SS 316 BOLTS	MANWAY	3'-0" CL	270°
B	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 4	1'-8" CL	90°
C	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 1	1'-8" CL	180°
D	1	6" FLANGE NOZZLE	CLEAN OUT	1'-0" CL	45°
E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG



APPROVAL NEEDED

06/21/2017

MATT

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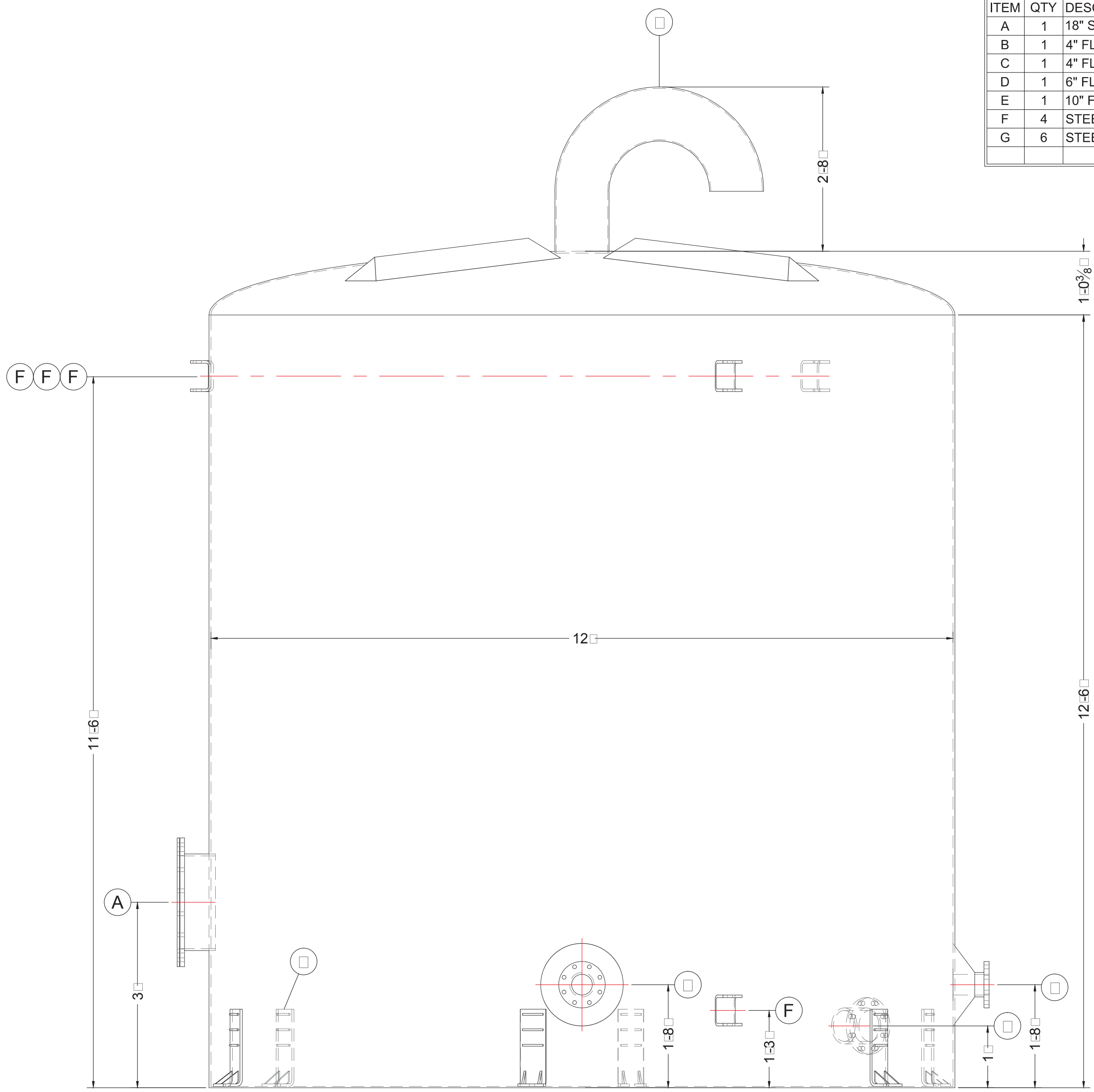
CLOSURE OF INACTIVE NABORS LANDFILLS

MOUNT HOME, AR

Fiberglass Tank Solutions
278 Nomore Lane, Montreal, MO 65591
573-317-9620



TANK 3 - BOM

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG.
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E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG

□□N□RAL NOT□S□

1□ FLAN□□S AR□ □R LL□□□□ R ANS□ 16 5□ LASS 150 RAT□□ FOR 50□S□ OLT □OL□S TO STRA□□L□ R N□□L□TAN□ □NT□RL N□S NO□□L□S TO □RO□□□T 5□ NL□SS OT□□RW S□NOT□□ ALL FLAN□ □S□AN□ SMALL□R W LL□□ LAT□□SS□T□□ N□□□N□□NT S□□ORTS FOR ALL□ N□LOA□S TO□S□L□□OT□RS□ A□O□□□STRA N ON F□□R□LASS F TT N□S AN□S□FL□□L□ONN□□T ONS W□□R□ OSS□L□□
2□ NO□□L□S□RO□□T 2□NTO TAN□□
3□ □□SS□L TO□A□□OM□L□T□OTTOM S□□ORT□□STOM□R□
□□ F□□R□LASS TAN□SOL□T ONS R□□OMM□N□S□T AT□A□□TAN□□WAT□R F LL□□ □□RO□T□ST□□FOR A 2□□O□R□□RO□AFT□R T□□TAN□S NSTALL□□□
5□ TAN□□OL□□OWNS M□ST□□S□□R□L□FAST□N□□TO FLOOR□
6□ □RO□□R□NT N□M□ST□□T L□□□F□□NT S□R□□NS AR□□R□S□NT T□□□ S□O□L□□□T□L□AN□A L□□
7□ TAN□S□□S□N□□FOR ATMOS□□R□□R□SS□R□STORA□ONL□□FA L□R□□TO O□S□R□□T□S□O□L□R□S□LT N TAN□FA L□R□AN□O□TAN□WARRANT□□
8□ □O NOT□NT□R TAN□NL□SS F□□RAL□STAT□O S□A TAN□□NTR□RO□□□□R□S □A□□□N FOLLOW□□□
9□ □O NOT LO□AT□AN□□OR□OLTS N TAN□A□□FOR□R□□□T OF TAN□□ F□□R□LASS TAN□SOL□T ONS W LL NOT□□R□S□ONS□L□FOR□R□S□T AN□□OR □OLTS□
10□ ALL□L□□TR□AL AN□M□□□AN□AL□ONN□□T ONS□□OT□□RS□
11□ ALL□OLTS,□AS□□TS, AN□AN□□OR□OLTS□□OT□□RS□NL□SS OT□□RW S□NOT□□□
12□ □□T□RNAL□□L□OAT TO□□5 M L M N M□M T□□□N□SS NO F□L□□A NT□□ □RO□□□□□FTS□
13□ ALL□M□NS ONS AR□□N N□□□S□NL□SS OT□□RW S□NOT□□□
1□□ AN□T□□N□NOT L ST□□ON T□S□RAW N□S NOT□RO□□□□□FTS□
15□ F□□R□LASS TAN□SOL□T ONS W LL FA□R□AT□□R T□□F NAL FTS□□RT F□□ □RAW N□□T□S T□□R□□W N□A□T□ORT□S R□S□ONS□L T□TO R□□W T□□ □RAW N□TO ASS□R□A□□RAT□LA□M□NT OF□□R□□, RA□□S, □L□□AT ON, □T□□OF □T□MS L ST□□FOR T□□TAN□□
16□ WARRANT□W LL□□O□□□FOR NON□A□M□NT OR LAT□□A□M□NT□

WARN N□□

1□ □□SS□L M□ST□□□R□□TL□□NT□□TO ATMOS□□□R□□S N□A□OOS□N□□□OR M□S□ROOM□NT, AN□□NT M□ST NOT□□ONN□□T□□TO A F□M□OLL□□T ON S□ST□M□SS□L M□ST□□□□□W T□AN O□RFLOW W□M□ST NOT□□ □S□AR□□N□R L□□OR□ONN□□T□□TO A□N□S□ST□M W□M□T□□ □LO□□W T□□, SL□□□, AN MAL N□STS, □T□□NT AN□O□RFLOW O□N AR□AS M□ST□□OM□N□AR□AS OF ALL O□TL□TS□N WORST□AS□S□T □ON□T ON□F A□□T ONAL NO□L□S AR□A□□, □NSTR□□T□NOT TO□LOS□, □□ASS, R□STR□T, OR ALT□R□NT N□AN□O□□RFLOW S□ST□MS FA L□R□TO FOLLOW T□S□RO□□□R□O□L□R□S□LT N TAN□L□A□A□, S□LLS OR □ATASTRO□□FA L□R□□
2□ □L□AS□R□A□F□□R□LASS TAN□SOL□T ONS□AN□L N□AN□NSTALLAT ON NSTR□□T ONS□AR□F LL□FA L□R□TO□OM□L□W T□NSTR□□T ONS MA□□AMA□□ TAN□AN□W LL□O□T□□WARRANT□□

TAN□□A□	12□0□
TAN□ST WALL□	12□6□
TAN□TO□□	□OM□
TAN□□OTTOM□	FLAT
TAN□T□□N□SS□	S□□LAM NAT ON S□□□N□□S
NO□R□□□	1
□□SS□L□ONT□NT□	L□A□□AT□
□□SS□L□A□A□T□□	10,576 NOM NAL□ALLONS
□ST MAT□□M□T□W□□T□	2,600 L□S
□OLT N□MAT□R AL□	316 S□S□
□AS□T MAT□R AL□	□□□M
□□T□S□RFA□□OLOR□	□RA□
□□S□N□O□□□	ASTM-□-3299
S□□□F□□RA□T□□	1□0
□□S□N□R□SS□R□□	ATMOS□□□R□
□□S□N T□M□RAT□R□□	120° (F)
S□SM□LOA□N□□	
W N□LOA□N□□	
L N□R□□L□	N□□□S
L N□R R□S N□	□□TRON 922□□
TOTAL L N□R T□□N□SS□	120 M L M N M□M
STR□□T□R□T□□□□	F LAM□NT WO□N□
STR□□T□R□R□S N□	□□
□ATAL□ST S□ST□M□	M□□□
NO□L□RAT N□□	50□S□
□S□A□□□T□	ASTM-□-2563
□AR□OLT□ST□	ASTM-□-2583
□□RN T□ST□	ASTM-□-258□
□□□ROT□ST□	NON□
□OST□□R□□	NON□
NO□□L□□TO□TS□	NON□

APPROVAL NEEDED

□L□AS□□□NO□L□LO□AT ONS AN□M□AS□R□M□NTS S□OWN NOT□ALL □□AN□S N R□AN□R□T□RN□R NT□S□N N□A□RO□AL, T□S□S AN A□R□M□NT T AT ALL□AN□S AR□OM□L□T□AN□F NAL□□STOM□R□

- [ ] A□RO□□□, W T□NO□AN□S
- [ ] A□RO□□□, W T□R□S ONS
- [ ] NOT A□RO□□□, R□S□M T

A□RO□□□□□: ____________________

□AT□□: ____________________

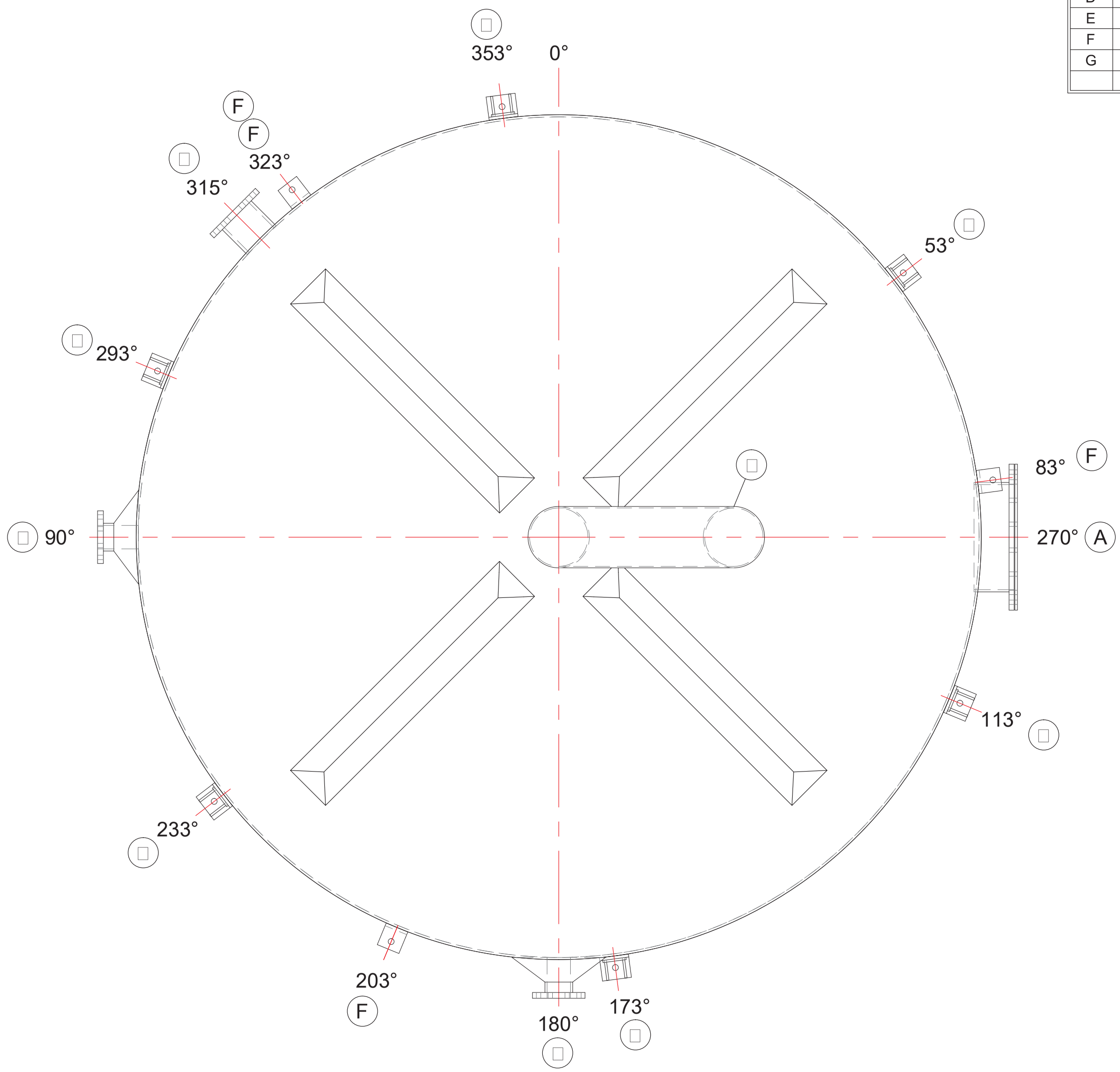
R□□□ 00	R□□AT□□ 00/00/0000
S□□T T TL□□ TAN□3□L□□AT ON□W	
□RO□□T□ CLOSURE OF INACTIVE NABORS LANDFILLS MOUNT HOME, AR	
□RAWN□AT□□ 06/21/2017	□RAWN□□ MATT
S□T S□□□ □	

Fiberglass Tank Solutions

278 Nomore Lane, Montreal, MO 65591
□□573-317-9620

TANK 4 - BOM

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG.
A	1	18" SIDE MANWAY W/ COVER, EPDM GASKET & SS 316 BOLTS	MANWAY	3'-0" CL	90°
B	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 3	1'-8" CL	270°
C	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 2	1'-8" CL	180°
D	1	6" FLANGE NOZZLE	CLEAN OUT	1'-0" CL	315°
E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG



□□N□RAL NOT□S□

1□ FLAN□□S AR□□R LL□□□□R ANS□□16.5□LASS 150 RAT□□FOR 50□S□□OLT□OL□S TO STRA□□L□□□R N□□L□TAN□□□NT□RL N□S NO□□L□S TO □RO□□□T 5□□NL□SS OT□□RW S□NOT□□□ALL FLAN□□S□□AN□SMALL□R W LL□□□□LAT□□□SS□T□□□ N□□□□N□□NT S□□□ORTS FOR ALL□□□N□LOA□S TO□□S□□□L□□□□OT□□RS□ A□O□□□□□STRA N ON F□□R□LASS F TT N□S AN□□S□FL□□□L□□ONN□□T ONS W□□R□□OSS□L□□
2□ NO□□L□S□RO□□□T 2□NTO TAN□□
3□ □□SS□L TO □A□□□OM□L□T□□OTTOM S□□□ORT□□□□STOM□R□
□□ F□□R□LASS TAN□SOL□T ONS R□□OMM□N□S T□AT□A□□TAN□□□WAT□R F LL□□ □□□RO□T□ST□□□FOR A 2□□O□R□□R O□AFT□R T□□TAN□□S NSTALL□□□
5□ TAN□□OL□□OWNS M□ST□□□S□□□R□L□FAST□N□□□TO FLOOR□
6□ □RO□□R□□NT N□M□ST□□□□T L□□□□□F□□NT S□R□□NS AR□□R□S□NT T□□□ S□O□L□□□□□□□T□L□AN□A L□□
7□ TAN□□S□□S□N□□□FOR ATMOS□□□R□□R□SS□R□STORA□□□ONL□□FA L□R□□TO O□S□R□□□T□□S□O□L□R□S□LT N TAN□FA L□R□AN□□O□TAN□WARRANT□□
8□ □O NOT□NT□R TAN□□NL□SS F□□□RAL□STAT□O S□A TAN□□NTR□□RO□□□□R□S □A□□□□□N FOLLOW□□□
9□ □O NOT LO□AT□AN□□OR□OLTS N TAN□□A□□□FOR□R□□□□T OF TAN□□ F□□R□LASS TAN□SOL□T ONS W LL NOT□□R□S□ONS□L□FOR□R□S□T AN□□OR □OLTS□
10□ ALL□L□□TR□AL AN□M□□□AN□AL□ONN□□T ONS□□OT□□RS□
11□ ALL□OLTS,□AS□□TS, AN□AN□□OR□OLTS□□OT□□RS□NL□SS OT□□RW S□NOT□□□
12□ □□T□RNAL□□L□OAT TO□□5 M L M N M□M T□□□N□SS NO F□L□□A NT□□ □RO□□□□□□FTS□
13□ ALL□M□NS ONS AR□□N N□□□S□NL□SS OT□□RW S□NOT□□□
1□□ AN□T□N□NOT L ST□□ON T□S□RAW N□□S NOT□RO□□□□□□□FTS□
15□ F□□R□LASS TAN□SOL□T ONS W LL FA R□AT□□R T□□F NAL FTS□□RT F□□ □RAW N□□T S T□□R□□□W N□A□T□ORT□S R□S□ONS□L T□TO R□□□W T□□ □RAW N□TO ASS□R□A□□□RAT□□LA□□M□NT OF□□□R□□, RA□□S, □L□□AT ON, □T□□OF□T MS L ST□□FOR T□□TAN□□
16□ WARRANT□W LL□□□O□□□□FOR NON□A□M□NT OR LAT□□A□M□NT□

WARN N□□

1□ □□SS□L M□ST□□□R□□TL□□NT□□TO ATMOS□□□R□□S N□A□OOS□N□□□OR M□S□ROOM□□NT, AN□□NT M□ST NOT□□ONN□□T□□TO A F□M□□OLL□□T ON S□ST□M□SS□L M□ST□□□□□□□□W T□AN O□□RFLOW W□□□M□ST NOT□□ □S□□AR□□□□N□□R L□□□□OR□ONN□□T□□TO A□□N□S□ST□M W□□M□□T□□ □LO□□□□W T□□□, SL□□□□, AN MAL N□STS, □T□□NT AN□O□□RFLOW O□□N AR□AS M□ST□□□□□□OM□N□□AR□AS OF ALL O□TL□TS□N WORST□AS□□S□T □ON□T ON□F A□□T ONAL NO□□L□S AR□A□□□□, □□NSTR□□T□□NOT TO□LOS□, □□□ASS, R□STR□T, OR ALT□R□□NT N□AN□O□□RFLOW S□ST□MS FA L□R□□TO FOLLOW T□S□RO□□□□R□□O□L□R□S□LT N TAN□L□A□A□□, S□LLS OR □ATASTRO□□□FA L□R□□
2□ □L□AS□R□A□F□□R□LASS TAN□SOL□T ONS□AN□L N□AN□NSTALLAT ON NSTR□□T ONS□AR□F LL□FA L□R□TO□OM□L□W T□NSTR□□T ONS MA□□AMA□□ TAN□AN□W LL□O□T□□WARRANT□□

TAN□□A□	12-0□
TAN□ST WALL□	12-6□
TAN□TO□□	□OM□
TAN□□OTTOM□	FLAT
TAN□T□□N□SS□	S□□LAM NAT ON S□□□□N□□S
NO□R□□□□	1
□□SS□L□ONT□NT□	L□A□□AT□
□□SS□L□A□A□T□□	10,576 NOM NAL□ALLONS
□ST MAT□□M□T□W□□□T□	2,600 L□S
□OLT N□MAT□R AL□	316 S S□
□AS□T MAT□R AL□	□□□M
□□T S□RFA□□□OLOR□	□RA□
□□S□N□O□□□	ASTM-□-3299
S□□□F□□RA□T□□	1□0
□□S□N□R□SS□R□□	ATMOS□□□R□
□□S□N T□M□□RAT□R□□	120° (F)
S□SM□LOA□N□□	
W N□LOA□N□□	
L N□R□□L□	N□□□S
L N□R R□S N□	□□TRON 922□□
TOTAL L N□R T□□□N□SS□	120 M L M N M□M
STR□□T□R□T□□□□	F LAM□NT WO□N□
STR□□T□R□R□S N□	□□
□ATAL□ST S□ST□M□	M□□□
NO□□L□RAT N□□	50□S□
□S A□□□□T□	ASTM-□-2563
□AR□OL T□ST□	ASTM-□-2583
□□RN T□ST□	ASTM-□-258□
□□□ROT□ST□	NON□
□OST□□R□□	NON□
NO□□L□□TO□TS□	NON□

APPROVAL NEEDED

□L□AS□□□□□□NO□L□LO□AT ONS AN□M□AS□R□M□NTS S□OWN NOT□ALL □□AN□□S N□R□AN□R□T□RN□R NT□□S□N N□A□RO□AL T□S□S AN A□R□□M□NT T□AT ALL□□AN□□S AR□□OM□L□T□AN□F NAL□□□STOM□R□

- [ ] A□□RO□□□, W T□NO□□AN□□S
- [ ] A□□RO□□□, W T□R□□□S ONS
- [ ] NOT A□□RO□□□, R□S□□M T

A□□RO□□□□□□ ______________________

□AT□□ ______________________

R□□□	R□□□AT□□
00	00/00/0000

S□□□T T TL□□: TAN□□□LAN□□W

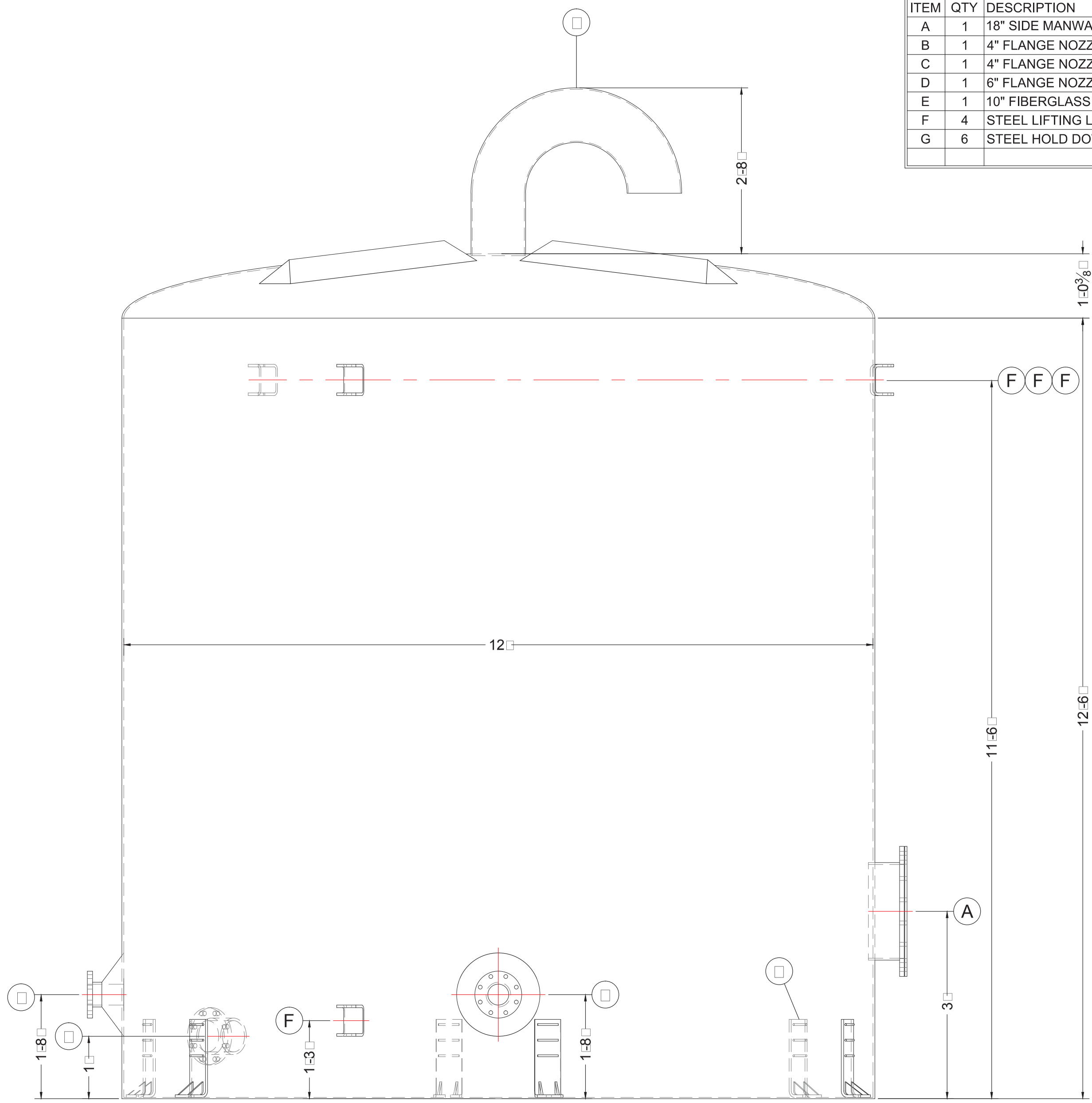
□RO□□□T□: CLOSURE OF INACTIVE NABORS LANDFILLS
MOUNT HOME, AR

□RAWN□AT□□	□RAWN□	S□T S□□□
06/21/2017	MATT	□

Fiberglass Tank Solutions
278 Nomore Lane, Montreal, MO 65591
□□573-317-9620

ITEM	QTY	DESCRIPTION	SERVICE	ELEV.	DEG.
A	1	18" SIDE MANWAY W/ COVER, EPDM GASKET & SS 316 BOLTS	MANWAY	3'-0" CL	90°
B	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 3	1'-8" CL	270°
C	1	4" FLANGE NOZZLE W/ CONICAL GUSSETS	CONN. TANK 2	1'-8" CL	180°
D	1	6" FLANGE NOZZLE	CLEAN OUT	1'-0" CL	315°
E	1	10" FIBERGLASS GOOSENECK VENT W/ BIRD SCREEN	VENT	TOP	CENTER
F	4	STEEL LIFTING LUGS	LIFTING LUG	SEE DWG	SEE DWG
G	6	STEEL HOLD DOWN LUGS	HOLD DOWN	SEE DWG	SEE DWG

TANK 4 - BOM



TANK DIA	12'-0"
TANK ST WALL	12'-6"
TANK TOP	DOME
TANK BOTTOM	FLAT
TANK THICKNESS	S LAMINATION S N S
NO. R	1
VESSEL CONTENT	LEACHATE
VESSEL CAPACITY	10,576 NOMINAL GALLONS
ESTIMATED EMPTY WEIGHT	2,600 LBS
BOLTING MATERIAL	316 S S
GASKET MATERIAL	M
TS SURFACE COLOR	RA
DESIGN CODE	ASTM-D-3299
S F RATIO	1 0
DESIGN PRESSURE	ATMOSPHERIC
DESIGN TEMPERATURE	120° (F)
SEISMIC LOAD N	
WIND LOAD N	
LINER L	N S
LINER RESIN	TRON 922
TOTAL LINER THICKNESS	120 MIL MINIMUM
STRUCTURE T	FILAMENT WOUND
STRUCTURE RESIN	
CATALYST SYSTEM	M
NO L RATIN	50 S
S A T	ASTM-D-2563
BARCOL TEST	ASTM-D-2583
RNT ST	ASTM-D-258
ROT ST	NONE
OST R	NONE
NO L TO TS	NONE

APPROVAL NEEDED

- [ ] APPROVED, WITH NO CHANGES
- [ ] APPROVED WITH REVISIONS
- [ ] NOT APPROVED, RESUBMIT

APPROVED BY: ____________

DATE: ____________

REV: 00	REV DATE: 00/00/0000

TANK ELEVATION VIEW

CLOSURE OF INACTIVE NABORS LANDFILLS

MOUNT HOME, AR

DRAWN DATE	DRAWN BY	SHEETS
06/21/2017	MATT	

Fiberglass Tank Solutions
278 Nomore Lane, Montreal, MO 65591
573-317-9620

Fiberglass Tank Solutions

Limited Warranty – Fiberglass Wet Wells

Fiberglass Tank Solutions, LLC (FTS) warrants to (Owner) that our underground wet well package, if installed, used and maintained in the United States in accordance with FTS published specifications, installation instructions and operating guidelines, all applicable laws and requirements, and the limited wet well applications defined herein, will be free from material defects in materials and workmanship for a period of one (1) year from date of original delivery by FTS. Wet well applications for the purpose of this warranty are limited to the collection and storage of water, wastewater or solids or liquid organic sewage at temperatures not to exceed 140 degrees F.

FTS warrants to the Owner that all wet well accessories, if installed, used and maintained in the United States in accordance with the FTS's' published specifications, installation instructions and operating guidelines, and all applicable laws and regulations, will be free from material defects in material and workmanship for a period of one (1) year following the date of original delivery by FTS.

The foregoing warranty does not extend to wet wells or accessories (collectively "Goods") damaged due to acts of God, war, terrorism, or failure of Goods caused, in whole or in part, by misuse, improper installation, storage, servicing, maintaining, or operation in excess of the rated capacity, contrary to
their recommended use, or contrary to the wet well application defined above, whether intentional or otherwise, or any other cause or damage of any kind not the fault of FTS. FTS only warrants repairs or alternations performed by FTS or its authorized contractors.

Owner's sole and exclusive remedy for breach of warranty is limited at FTS's option to: (a) repair of the defective wet well or accessories, (b) delivery or replacement wet well or accessories to the point of original delivery, or (c) refund of the original purchase price of the whole or component in question. A claimant must give FTS the opportunity to observe and inspect the wet well and / or accessories prior to removal from the ground or the claim will be forever barred. All claims must be made in writing within one (1) year after wet well and /or accessory failure or be forever barred.

THE FOREGOING WARRANTY CONSTITUTES FTS'S EXCLUSIVE OBLIGATION AND FTS MAKES NO OTHER WARRANTY OR RERESENTAION, EXPRESS OR IMPLIED, WITH RESPECT TO THE WET WELL OR ANY SERVICE, ADVICE, OR CONSULTATION, IF ANY, FURNISHED TO THE OWNER BY FTS OR ITS REPRESENTATIVES, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PRPOSE, OR OTHERWISE. THE SELLER (IBERGLASS TANK SOLUTIONS, LLC) UNDERTAKES NO RESPONSIBILITY FOR THE QUALITY OF THE GOODS, EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT. THE SELLER (FTS) ASSUMES NO RESPONSIBILITY THAT THE GOODS WILL BE FIT FOR ANY PARTICULAR PURPOSE FOR WHICH YOU (OWNER) MAY BE BUYING THESE GOODS, EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT. THE REMEDIES SET FORTH IN THE ABOVE WARRANTY ARE THE ONLY REMEDIES AVAILABLE TO ANY PERSON OR ENTITY FOR BREACH OF WARRANTY OR FOR THE BREACH OF ANY OTHER COVENANT, DUTY, OR OBLIGATION ON THE PART OF FTS. FTS SHALL HAVE NO LIABILITY OR

OBLIGATION TO ANY PERSON OR ENTITY FOR BREACH OF ANY OTHER COVENANT, DUTY, OR OBLIGATION UNDER THIS WARRANTY EXCEPT AS EXPRESSLY SET FORTH HEREIN. IT IS EXPRESSLY AGREED THAT THE WARRANTY DOES NOT FAIL OF TIS ESSENTIAL PURPOSE. FTS SHALL HAVE NO LIABILITY FOR COST OF INSTALLATION OR REMOVAL OF GOODS,ENVIRONMENTAL CONTAMINATIONS, FIRE, EXPLOSIONS, OR ANY OTHER CONSEQUENCES ALLEGEDLY ATTRITABLE TO A BREACH OF WARRANTY OR INCIDENTAL CONSEQUENTIAL, PUNITIVE OR OTHER DAMAGES OF ANY DESCRIPTION, WHETHER ANY SUCH CLAIM OR DAMAGES BE BASED UPON WARRANTY, CONTRACT, NEGLIGENDE, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE. IN NO EVENT SHALL FTS, INC.S' TOTAL LIABILITY HEREUNDER EXCEED THE ORIGINAL PURCHASE PRICE OF THE GOODS WHICH GAVE RISE TO SUCH LIABILITY.

Fiberglass Tank Solutions

278 Nomore Lane
Montreal, MO 65591
573-317-9620

PRECAST VAULT

ASTM C-478

SCURLOCK INDUSTRIES SHOP DRAWING

Scurlock Industries
of springfield, inc.
Box 1078 * 3401 W. Commercial
Springfield, MO 65801
417-862-5088 FAX 417-862-5090

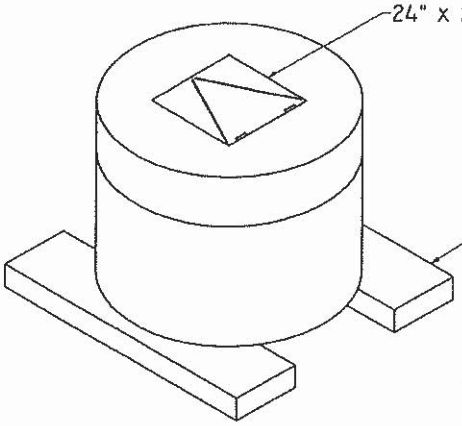
CONTRACTOR: ADVANCED FLUID TECHNOLOGIES

PROJECT: NABORS LANDFILL

DATE: 27 JUNE 17

STRUCTURE NO.: VAULT

STATION NO.:

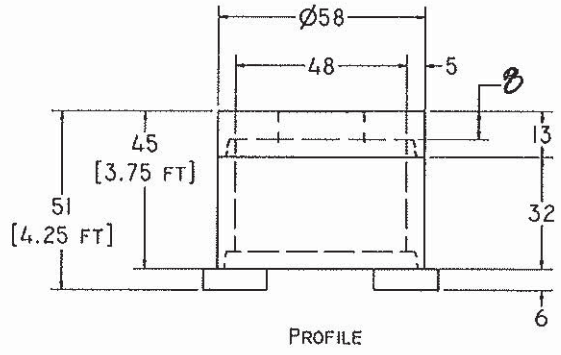


REINFORCEMENT

TOP: EQUIV. TO # 4 @ 5" O.C.E.W

WALLS: PER ASTM C-478

MANHOLE I.D. 48"

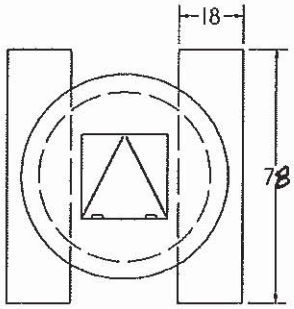


PROFILE

TOP: 13"

RISER: 32"

(2) SETTING BLOCKS:



PLAN VIEW

DIMENSIONS IN INCHES
UNLESS NOTED OTHERWISE

DRAWING NOT TO SCALE

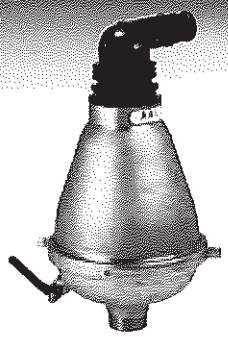
FEATURES		YES	NO	DETAILS
HATCH(ES)		✓		ALUM. HATCH
				ALUM. HATCH BY CONTRACTOR
TOP:		✓		
	SPECIAL			
BASE:				
	ARCHES/SLEEVES		✓	
	BOTTOM		✓	
	EXTENDED BASE		✓	
	JOINT MATERIAL	✓		
	STEPS		✓	
	SPECIAL		✓	SETTING BLOCKS

08-23-2016\...MH\AIR RELEASE\P3\ASMI-VI

A.R.I.

D-025 ST 150 PSI

D-025 STST 150 PSI



Wastewater

Combination Air Valve for Wastewater - Short Version

Description

The D-025 Combination Air Valve combines an air & vacuum component and an air release component in a single body. The valve is specifically designed to operate with liquids carrying solid particles such as wastewater and effluents. The combination air valve discharges air (gas) during the filling or charging of the system, admits air into the system during drainage and at water column separation and releases accumulated air (gas) from the system while it is operating under pressure. The valve's unique design enables the separation of the liquid from the sealing mechanism and assures optimum working conditions.

Applications

- Wastewater & water treatment plants.
- Wastewater and effluent water transmission lines.

Operation

The air & vacuum component discharges air at high flow rates during the filling of the system and admits air into the system at high flow rates during drainage and at water column separation.
High velocity air will not blow the float shut. Water will lift the float which activates the sealing of the valve.
At any time during system operation, should internal pressure of the system fall below atmospheric pressure, air will enter the system.
The smooth discharge of air reduces pressure surges and other destructive phenomena.
The intake of air in response to negative pressure protects the system from destructive vacuum conditions and prevents damage caused by water column separation. Air entry is essential to efficiently drain the system.
The air release component releases entrapped air in pressurized systems.

Without air valves, pockets of accumulated air may cause the following hydraulic disturbances:

- Restriction of effective flow due to a reduction of the flow area. In extreme cases this will cause complete flow stoppage.
- Obstruction of efficient hydraulic transmission due to air flow disturbances.
- Acceleration of cavitation damages.
- Increase in pressure transients and surges.
- Internal corrosion of pipes, fittings and accessories.
- Dangerous high-energy bursts of compressed air.
- Inaccuracies in flow metering.

As the system fills and is pressurized, the combination wastewater air valve functions in the following stages:

1. Air (gas) is discharged by the valve
2. When the liquid level reaches the valve's lower portion, the lower float is lifted, pushing the sealing mechanism to its sealing position.
3. The entrapped air is confined in a pocket between the liquid and the sealing mechanism. The air pressure is equal to the system pressure.
4. Increases in system pressure compress the trapped air in the upper section of the conical chamber. The conical shape assures the height of the air gap. This enables separation of the liquid from the sealing mechanism.
5. Entrapped air (gas), accumulating at peaks and along the system, rises to the top of the valve and displaces the liquid in the valve's body.
6. When the liquid level lowers to a point where the float is no longer buoyant, the float drops, unsealing the rolling seal. The air release orifice opens and allows part of the air that accumulated in the upper portion of the valve to be released to the atmosphere.
7. Liquid enters the valve. The float rises, pushing the rolling seal to its sealing position. The remaining air gap prevents the wastewater from fouling the mechanism.

When internal pressure falls below atmospheric pressure (negative pressure):

1. The floats will drop down, immediately opening the air & vacuum and air release orifices.
2. Air will enter into the system.

Main Features

- Working pressure range: 3 - 150 psi.
- Testing pressure: 360 bar.
- Maximum working temperature: 140° F.
- Maximum intermittent temperature: 194° F.
- The unique design of the valve prevents contact between the wastewater and the sealing mechanism by creating an air gap at the top of the valve. These features are achieved by:

• The conical body shape: designed to maintain the maximum distance between the liquid and the sealing mechanism and still obtain minimum body length.
• Independent spring-guided linkage between the lower float/rod assembly and the upper float sealing mechanism: allows free movement of the float and rod. Vibrations and movement of the lower float due to turbulence will not unseal the upper float sealing mechanism.
• The Rolling Seal Mechanism: less sensitive to pressure differentials than a direct float seal. It accomplishes this by having a comparably large orifice for a wide pressure range (up to 150 psi).
• Funnel-shaped lower body: designed to ensure that residue wastewater matter will fall back into the system and be carried away by the main pipe.
- All inner metal parts made of stainless steel. Float made of composite materials.
- 1 ½" threaded discharge outlet enables connection of a vent pipe.
- Dynamic design allows for high capacity air discharge while preventing premature closure.
- The ball valve can be opened to release trapped pressure and drain the valve body prior to maintenance and for back-flushing during maintenance.

Valve Selection

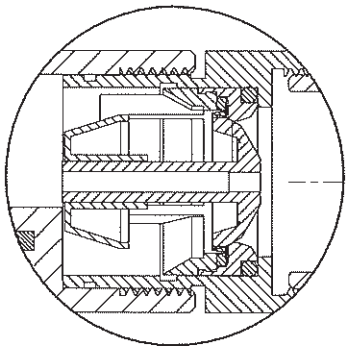
- These valves are available in 2", 3" with a NPT male threaded connection or flanged 2",3",4", standard upon request.
- Valve is manufactured in stainless steel, also available in reinforced nylon.
- With a One-way, Out-only attachment, allows for air discharge only, prevents air intake.
- With a Vacuum Breaker, In-only attachment, allows for air intake only, prevents air discharge.
- With a Non-Slam discharge-throttling attachment, allows for free air intake, throttles air discharge.

Note

- The D-025 air valve is intended for use with raw wastewater. For use with aggressive liquids, please consult with our application engineers or with the marketing dept.
- For best suitability, it is recommended to send the fluid chemical properties along with the valve request.
- Upon ordering, please specify: model, size, working pressure, thread and flange standard and type of liquid.

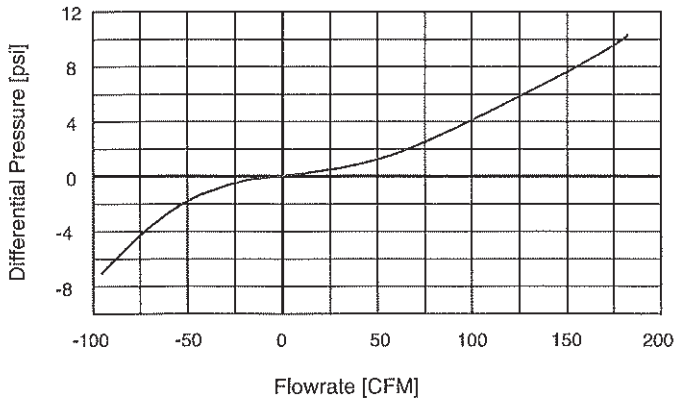
D-025 Non-Slam Single Orifice Add-on Component Data Table

Inlet Size	Discharge Orifice	Total NS Area	NS Orifice	Switching Point	Flow at 5.8 psi
2" , 3" , 4"	1.5 Inch	0.02 Sq.In.	0.16 Inch	Spring loaded Normally closed	10.3 CFM

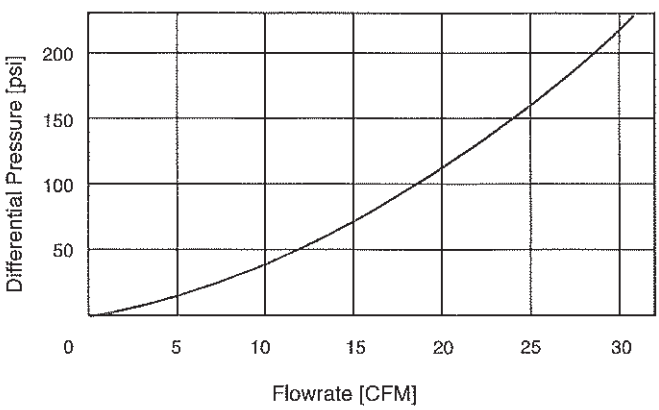


D-025-NS

AIR & VACUUM FLOWRATE



AIR RELEASE FLOWRATE



D-025 ST

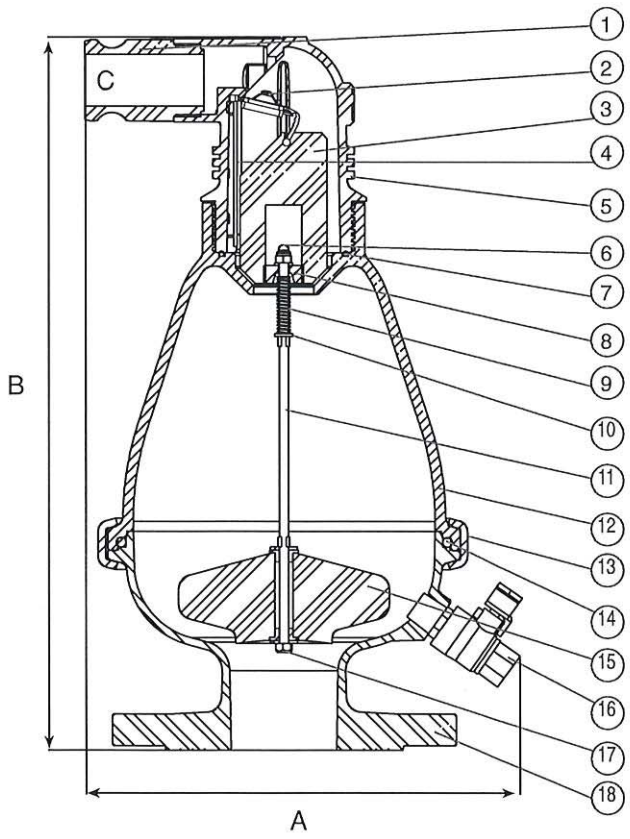
A.R.I.

DIMENSIONS AND WEIGHTS

Inlet Size	Dimensions Inch A	B	Connection C	Weight Lbs. ST	STST	Orifice Area Sq.in Air Rel.	A / V
2" Threaded	10.2	17.9	1½" NPT Female	31.7	31.7	0.018	1.246
2" Flanged	10.2	18.1	1½" NPT Female	35.7	35.7	0.018	1.246
3" Flanged	10.2	18.1	1½" NPT Female	-	-	0.018	1.246
4" Flanged	10.2	18.1	1½" NPT Female	40.5	40.5	0.018	1.246

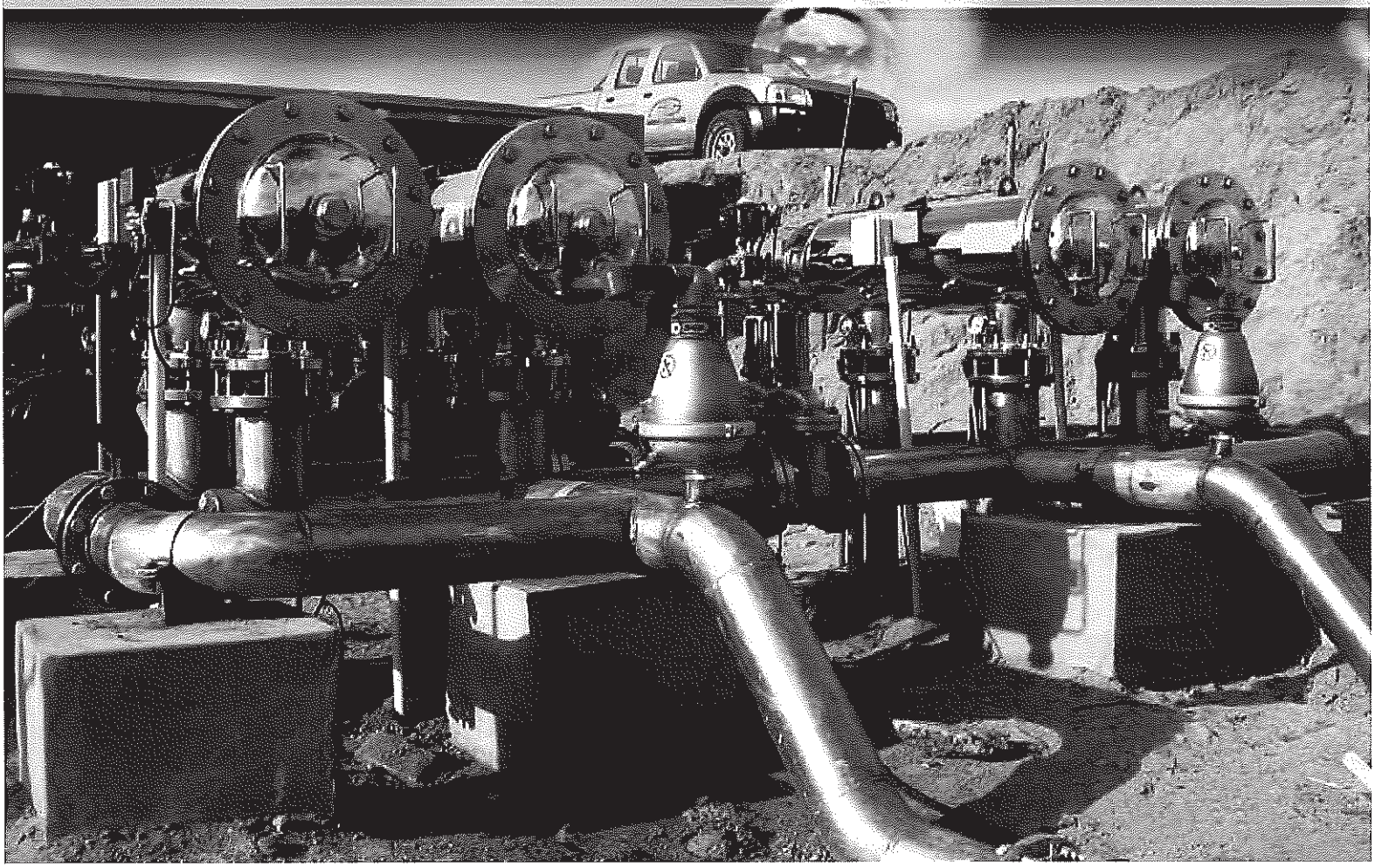
PARTS LIST AND SPECIFICATION

No.	Part	Material
1.	Camlock Connection	Polypropylene
2.	Rolling Seal Assembly	Polypropylene / Reinforced Nylon + E.P.D.M. + ST ST
3.	Float	Foamed Polypropylene
4.	Clamping Stem	Polypropylene / Reinforced Nylon
5.	Body	Reinforced Nylon / Stainless Steel SAE 316
6.	Domed Nut	Stainless Steel SAE 316
7.	O-Ring	BUNA-N
8.	Stopper	Polypropylene
9.	Spring	Stainless Steel SAE 316
10.	Washer	Stainless Steel SAE 316
11.	Stem	Stainless Steel SAE 316
12.	Body	Stainless Steel SAE 316
13.	Clamp	Stainless Steel SAE 316
14.	O-Ring	BUNA-N
15.	Float	Foamed Polypropylene
16.	Ball Valve 1/4 "	Stainless Steel
17.	Washer	Stainless Steel SAE 316
18.	Base	Stainless Steel SAE 316

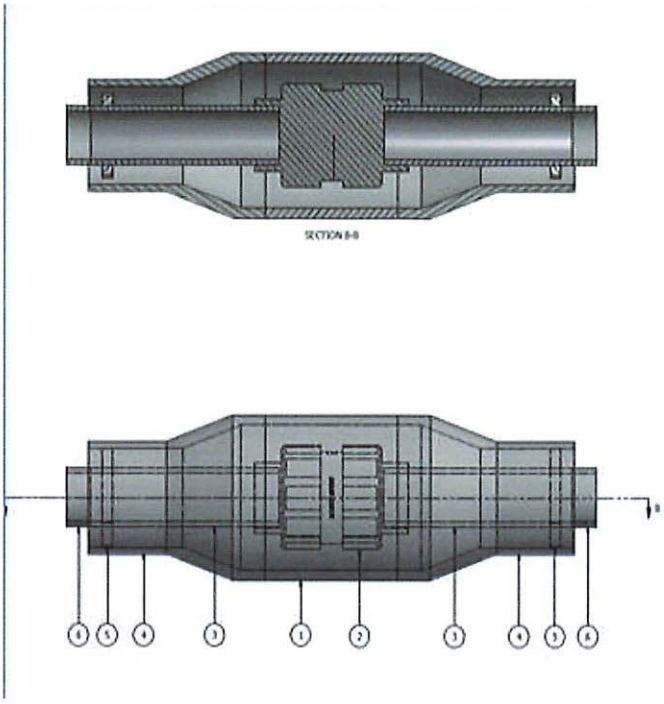


D-025 ST

A.R.I.



A.R.I. USA, Inc. A.R.I. FLOW CONTROL ACCESSORIES Ltd. www.ariusa.com e-mail: ariusa@ari.co.il Tel: (559) 269-9653

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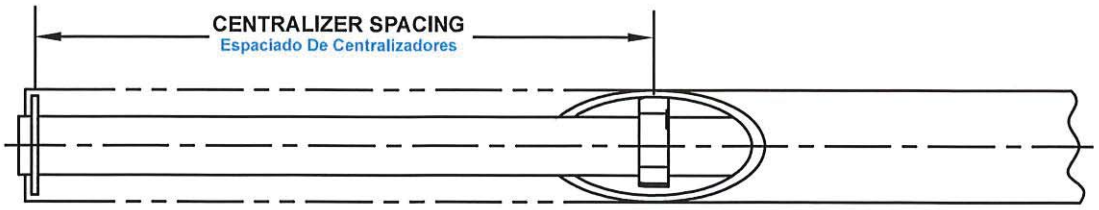


Table 1: Common Size Combinations of Dual Containment Piping

Tabla 1: Combinaciones comunes de tamaños para tubería de doble contención

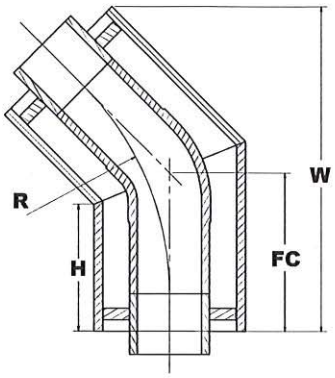
Nominal Size (in) Tamaño nominal	Carrier DR Transporador DR	Containment DR Contencion DR	Carrier Pipe Tubería Transporador		Containment Pipe Tubería Contencion		Approx. Support Spacing (in) Espacio de Soporte Aprox.	Weight (lbs/ft) Peso
			OD (in)	ID (in)	OD (in)	ID (in)		
1 x 3	11	11	1.315	1.047	3.5	2.826	34	1.6
1 x 4	11	11	1.315	1.047	4.5	3.633	34	2.5
	11	17	1.315	1.047	4.5	3.938	34	1.8
1½ x 4	11	11	1.900	1.533	4.5	3.633	34	2.7
	11	17	1.900	1.533	4.5	3.938	34	2.0
2 x 4	11	11	2.375	1.917	4.5	3.633	37	2.9
	11	17	2.375	1.917	4.5	3.938	37	2.2
2 x 6	11	11	2.375	1.917	6.625	5.349	37	5.6
	11	17	2.375	1.917	6.625	5.798	37	4.0
3 x 6	11	11	3.500	2.826	6.625	5.349	48	6.4
	11	17	3.500	2.826	6.625	5.798	48	4.7
4 x 8	11	11	4.500	3.633	8.625	6.963	53	10.7
	11	17	4.500	3.633	8.625	7.55	53	7.9
	17	17	4.500	3.938	8.625	7.55	48	7.2
6 x 10	11	11	6.625	5.349	10.75	8.679	60	18.1
	11	17	6.625	5.349	10.75	9.41	60	13.8
	11	32.5	6.625	5.349	10.75	10.049	60	10.8
	17	17	6.625	5.798	10.75	9.41	60	12.1
	17	32.5	6.625	5.798	10.75	10.049	60	9.2
8 x 12	11	11	8.625	6.963	12.75	10.293	68.5"	26.8
	11	17	8.625	6.963	12.75	11.16	68.5"	20.8
	17	17	8.625	7.550	12.75	11.16	60"	18.0
	17	32.5	8.625	7.550	12.75	11.919	60"	12.3

1. Pressure ranges from gravity flow to more than 200 psi
2. Carrier pipe sizes from 1" - 54" OD.
3. Containment pipe sizes from 3" - 63" OD.
4. Standard factory centralizer support spacing based upon limited deflection of carrier pipe.

1. La presión varía desde flujo por gravedad hasta más de 200 psi.
2. Tamaños del tubo transportador de 1 a 54 pulgadas de diámetro externo.
3. Tamaños del tubo de contención de 3 a 63 pulgadas de diámetro externo.
4. Espaciado estándar de fábrica del soporte centralizador en base a la deflexión límite de la tubería transportadora.

45° ELBOW

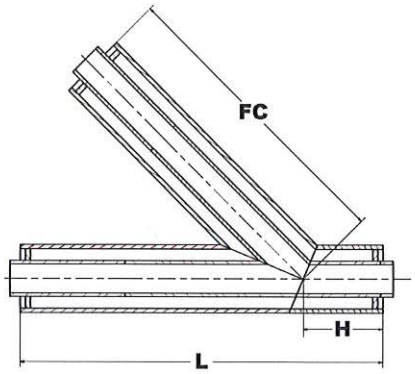
Codo De 45°



Nominal Size (in) Tamaño nominal	Carrier DR Transporador DR	Containment DR Contencion DR	R (in)	H (in)	FC (in)
1 x 3	11	11	6.04	4.28	5
1 x 4	11	11, 17	6.04	4.07	5
1.5 x 4	11	11, 17	6.04	4.07	5
2 x 4	11	11, 17	6.04	4.07	5
2 x 6	11	11, 17	8.45	5.63	7
3 x 6	11	11, 17	8.45	5.63	7
4 x 8	11, 17	11, 17	9.96	6.21	8
6 x 10	11, 17	11, 17, 32.5	14.49	7.27	9.5
8 x 12	11, 17	11, 17, 32.5	16.9	7.36	10

45°
LATERAL WYE

Y Lateral De 45°

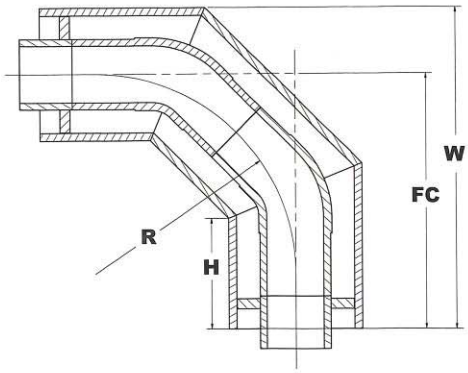


Nominal Size (in) Tamaño nominal	Carrier DR Transporador DR	Containment DR Contencion DR	L (in)	H (in)	FC (in)
2 x 4	11	11, 17	26.5	6.8125	20.4375
2 x 6	11	11, 17	35.5	7.75	29.25
3 x 6	11	11, 17	35.5	7.75	29.25
4 x 8	11, 17	11, 17	40	9.6875	32.1875
6 x 10	11, 17	11, 17	50.5	10.125	37.25
8 x 12	11, 17	11, 17	54.6	10.5625	38.0625

For reference only. Actual dimensions may vary.
Solo para referencia. Las dimensiones reales pueden variar.

90° ELBOW

Codo De 90°



Nominal Size (in) Tamaño nominal	Carrier DR Transporador DR	Containment DR Contencion DR	R (in)	H (in)	FC (in)
1 x 3	11	11	6.04	4.28	8.54
1 x 4	11	11, 17	6.04	4.07	8.54
1.5 x 4	11	11, 17	6.04	4.07	8.54
2 x 4	11	11, 17	6.04	4.07	8.54
2 x 6	11	11, 17	8.45	5.63	11.95
3 x 6	11	11, 17	8.45	5.63	11.95
4 x 8	11, 17	11, 17	9.96	6.21	13.83
6 x 10	11, 17	11, 17, 32.5	14.49	7.27	18
8 x 12	11, 17	11, 17, 32.5	16.9	7.36	19.9

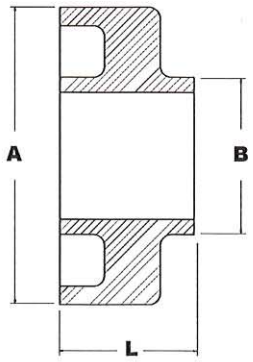
DID YOU KNOW?

ISCO's Fusion Manual provides step-by-step instruction on how to operate McElroy Fusion equipment. It's printed in both English and Spanish and comes on waterproof, tear-proof paper to last longer in the elements of field work.

El manual de fusión de ISCO ofrece instrucciones detalladas sobre cómo operar el equipo de fusion McElroy. Está impreso en Inglés y Español y viene en el papel resistente al agua y a prueba de desgarres para que dure más tiempo en los elementos de trabajo en sitio.

END TERMINATION

Terminación De Extremo



Nominal Size (in) Tamaño nominal	Carrier DR Transporador DR	Containment DR Contencion DR	L (in)	A (in)	B (in)
1 x 3	11	11	3	3.5	1.315
1 x 4	11	11, 17	3	4.5	1.315
1.5 x 4	11	11, 17	3	4.5	1.9
2 x 4	11	11, 17	3	4.5	2.375
2 x 6	11	11, 17	3	6.625	2.375
3 x 6	11	11, 17	3	6.625	3.5
4 x 8	11, 17	11, 17	4	8.625	4.5
6 x 10	11, 17	11, 17, 32.5	4	10.75	6.625
8 x 12	11, 17	11, 17, 32.5	4	12.75	8.62

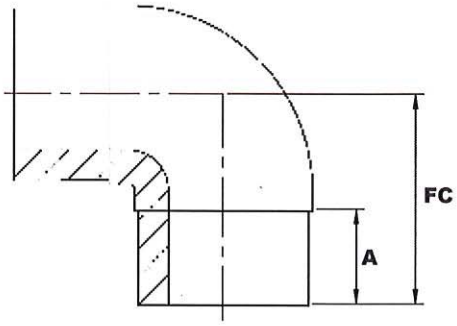
DID YOU KNOW?

In January 2013, ISCO announced its transition to an Employee Stock Ownership Plan (ESOP), handing the keys to the future to its dedicated employees.

En enero de 2013, ISCO anunció su transición a un Plan de Propiedad Participada de Empleados (ESOP), entregando las llaves del futuro a sus dedicados empleados.

90° ELBOW MOLDED

Codo De 90° Moldeado



DR	17	11	9	7
Pressure Rating Resistencia a la Presión	125 psi	200 psi	250 psi	333 psi

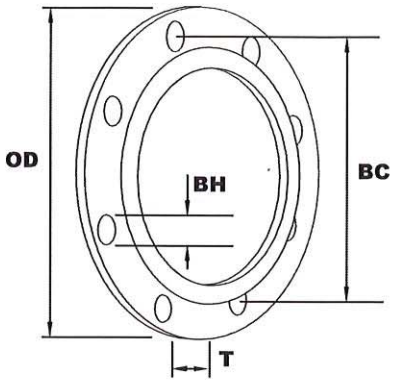
Nominal Size (in) Tamaño nominal	A (in)	FC (in)
¾	2.63	4
1	2.63	4
1¼	2.63	4
1½	2.63	4
2	2.81	4.5
3	3	5.13
4	3	5.75
6	4.38	9
8	6	12
10	6	13.25
12	7.5	15.88

1. Some size/DR combinations may have limited availability.
2. Other DRs available with counter-bored ID at fitting end.

1. Algunos Tamaño / DR Combinaciones puede tener disponibilidad limitada.
2. Otros proyectos de resolución disponibles con receta aburrido identificación en final apropiado.

BACK-UP RING - DUCTILE IRON
FOR USE WITH FLANGE ADAPTER

Anillo De Respaldo- De Hierro Dúctil Para Uso Con El Adaptador De Brida



Nominal Size (in) Tamaño nominal	DR	Pressure Rating Resistencia a la Presión	Actual OD (in) DE Actual	OD (in)	BC (in)	BH (in)	T (in)	Bolt # Perno #
¾	7	335	1.05	3.88	2.75	0.625	0.5	4
1	7	335	1.315	4.25	3.13	0.625	0.56	4
1 ¼	7	335	1.66	4.63	3.5	0.625	0.63	4
1 ½	7	335	1.9	5	3.88	0.625	0.69	4
2	7	335	2.375	6	4.75	0.75	0.75	4
2	11	200	2.375	6	4.75	0.75	0.5	4
3	7	335	3.5	7.5	6	0.75	0.94	4
3	11	200	3.5	7.5	6	0.75	0.53	4
4	7	335	4.5	9	7.5	0.75	0.94	8
4	11	200	4.5	9	7.5	0.75	0.55	8
6	7	335	6.625	11	9.5	0.875	1	8
6	11	200	6.625	11	9.5	0.875	0.63	8
8	7	335	8.625	13.5	11.75	0.875	1.12	8
8	11	200	8.625	13.5	11.75	0.875	0.85	8
10	7	335	10.75	16	14.25	1	1.19	12
10	11	200	10.75	16	14.25	1	0.98	12
12	7	335	12.75	19	17	1	1.5	12
12	11	200	12.75	19	17	1	1.25	12
14	7	335	14	21	18.75	1.125	1.63	12
14	11	200	14	21	18.75	1.125	1.38	12
16	7	335	16	23.5	21.25	1.125	1.88	16
16	11	200	16	23.5	21.25	1.125	1.65	16
18	7	335	18	25	22.75	1.25	1.9	16
18	11	200	18	25	22.75	1.25	1.67	16
20	7	335	20	27.5	25	1.25	2.13	20
20	11	200	20	27.5	25	1.25	1.81	20
22	7	335	22	29.5	27.25	1.375	2.3	20
22	11	200	22	29.5	27.25	1.380	2	20
24	7	335	24	32	29.5	1.375	2.5	20
24	9	250	24	32	29.5	1.375	2.13	20
24	11	200	24	32	29.5	1.375	2.17	20

1. Standard surface treatment is painted primer. Optional surface treatments are available as galvanized, epoxy-coated, or powered-coated. Availabilities may be extended.

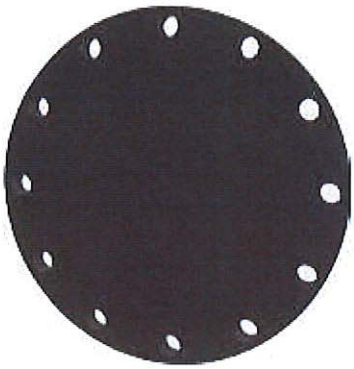
Nominal Size (in) Tamaño nominal	DR	Pressure Rating Resistencia a la Presión	Actual OD (in) DE Actual	OD (in)	BC (in)	BH (in)	T (in)	Bolt # Perno #
24	17	125	24	32.00	29.50	1.375	1.95	20
26	7	335	26	34.25	31.75	1.375	2.53	24
26	11	200	26	34.25	31.75	1.375	2.38	24
26	17	125	26	34.25	31.75	1.375	2	24
28	9	250	28	36.5	34	1.375	2.6	28
28	11	200	28	36.5	34	1.375	2.5	28
28	17	125	28	36.5	34	1.375	2.3	28
30	9	250	30	38.75	36	1.375	2.8	28
30	11	200	30	38.75	36	1.375	2.6	28
30	17	125	30	38.75	36	1.375	2.28	28
30	26	80	30	38.75	36	1.375	2.06	28
32	9	250	32	41.75	38.5	1.63	3	28
32	11	200	32	41.75	38.5	1.63	2.75	28
32	26	80	32	41.75	38.5	1.63	2.12	28
34	11	200	34	43.75	40.5	1.63	2.93	32
34	17	125	34	43.75	40.5	1.63	2.44	32
34	26	80	34	43.75	40.5	1.63	2.14	32
36	9	250	36	46	42.75	1.63	3.8	32
36	11	200	36	46	42.75	1.63	3.03	32
36	17	125	36	46	42.75	1.63	2.75	32
36	26	80	36	46	42.75	1.63	2.5	32
42	11	200	42	53	49.5	1.63	4.06	36
42	13.5	160	42	53	49.5	1.63	3.66	36
42	21	100	42	53	49.5	1.63	3	36
48	11	200	48	59.5	56	1.63	4.53	44
48	17	125	48	59.5	56	1.63	3.94	44
48	26	80	48	59.5	56	1.63	3.5	44
54	17	125	54	66.25	62.75	1.88	4	44
54	26	80	54	66.25	62.75	1.88	3.75	44
63	17	125	62.99	73	69.25	1.88	3.15	52
63	26	80	62.99	73	69.25	1.88	2.8	52

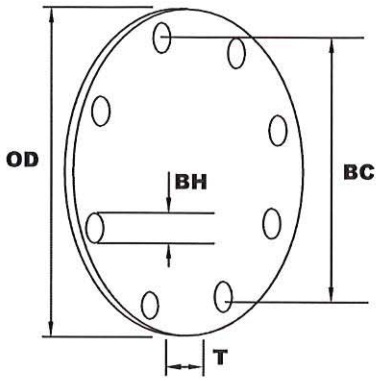
1. Tratamiento de la superficie Standard está pintado de imprimación. Tratamientos superficiales opcionales están disponibles como galvanizado, recubierto de polvo epoxi-recubiertos o. Disponibilidades podrán prorrogarse.

For reference only. Actual dimensions may vary.
Solo para referencia. Las dimensiones reales pueden variar.

BLIND FLANGE HDPE AND PVC

Brida Ciega De HDPE Y PVC





Nominal Size (in) Tamaño nominal	Material materiales	OD (in)	BC (in)	BH (in)	T (in)	Bolt # Perno #
¾	HDPE, PVC	3.875	2.75	0.625	1	4
1	HDPE, PVC	4.25	3.13	0.625	1	4
1 ¼	HDPE, PVC	4.625	3.5	0.625	1	4
1 ½	HDPE, PVC	5	3.88	0.625	1	4
2	HDPE, PVC	6	4.75	0.75	1	4
3	HDPE, PVC	7.5	6	0.75	1	4
4	HDPE, PVC	9	7.5	0.75	1	8
6	HDPE, PVC	11	9.5	0.875	1	8
8	HDPE, PVC	13.5	11.75	0.875	1	8
10	HDPE, PVC	16	14.25	1	1	12
12	HDPE, PVC	19	17	1	1	12
14	HDPE, PVC	21	18.75	1.125	1	12
16	HDPE, PVC	23.5	21.25	1.125	1	16
18	HDPE, PVC	25	22.75	1.25	1	16
20	HDPE, PVC	27.5	25	1.25	1	20
22	HDPE, PVC	29.5	27.25	1.375	1	20
24	HDPE, PVC	32	29.5	1.375	1	20
26	HDPE	34.25	31.75	1.375	1	24
28	HDPE	36.5	34	1.375	1	28
30	HDPE, PVC	38.75	36	1.375	1	28
32	HDPE	41.750	38.5	1.625	1	28
36	HDPE, PVC	46	42.75	1.625	1	32
40	HDPE	50.75	47.25	1.625	1	36
42	HDPE	53	49.5	1.625	1	36
48	HDPE	59.5	56	1.625	1	44
54	HDPE	66.25	62.75	1.875	1.5	44
63	HDPE	73	69.25	1.875	1.5	52

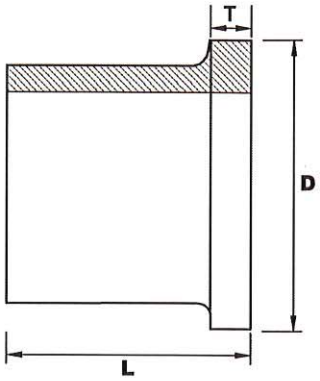
1. Bolt circle for IPS Blind Flanges are the same for DIPS Blind Flanges 24" and smaller.
2. HDPE and PVC Blinds are not rated for full pressure above 6".
3. Steel Blinds may not be fully pressure rated above 10" depending on pipe (system) DR.

1. La circunferencia de los pernos en las bridas ciegas ips es que el de las bridas ciegas dips de 24 pulgadas o menos.
2. Las bridas ciegas de hdpe y pvc por encima de 6 pulgadas no están categorizadas para presión máxima.
3. Las bridas ciegas de acero puede que no estén categorizadas para presión total por encima de 10 pulgadas dependiendo del dr de la tubería (sistema)

For reference only. Actual dimensions may vary.
Solo para referencia. Las dimensiones reales pueden variar.

FLANGE ADAPTER

Adaptador De Brida



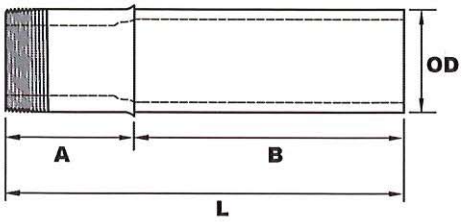
DR	32.5	26	21	17	15.5	13.5	11	9	7
Pressure Rating Resistencia a la Presión	63 psi	80 psi	100 psi	125 psi	138 psi	160 psi	200 psi	250 psi	333 psi

Nominal Size (in) Tamaño nominal	Actual OD (in) DE Actual	D (in)	L (in)	7	9	11	13.5	15.5	17	21	26	32.5
				T (in)	T (in)	T (in)	T (in)	T (in)	T (in)	T (in)	T (in)	T (in)
¾	1.05	1.85	4.02	-	-	0.39	-	-	-	-	-	-
1	1.315	2.36	4.02	-	-	0.39	-	-	-	-	-	-
1 ¼	1.66	2.8	4.02	-	-	0.39	-	-	-	-	-	-
1 ½	1.9	3.15	4.02	-	-	0.39	-	-	-	-	-	-
2	2.375	4	6	0.45	0.45	0.402	0.402	0.402	0.402	0.402	0.402	0.402
3	3.5	5	6	0.625	0.625	0.598	0.598	0.598	0.598	0.598	0.598	0.598
4	4.5	6.598	6.8	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8
6	6.625	8.5	8	1.2	1.2	0.799	0.799	0.799	0.799	0.799	0.799	0.799
8	8.625	10.598	9	1.625	1.625	1	1	1	1	1	1	1
10	10.75	12.799	10.75	2.299	1.5	1.299	1.299	1.299	1.28	0.902	0.902	0.902
12	12.75	15.252	11	2.598	1.875	1.54	1.5	1.5	1.54	1	1	1
14	14	17.5	11	3	2	1.701	1.701	1.701	1.625	1.098	1.098	1.098
16	16	20	12	3.858	2.25	1.902	1.902	1.902	1.875	1.201	1.201	1.201
18	18	21.098	12	3.63	2.5	2.1	2.1	2.1	2	1.25	1.25	1.25
20	20	23.5	12	3.938	3.49	2.3	2.3	2.3	2.27	1.39	1.39	1.39
22	22	25.6	12	4.36	3.92	2.5	2.5	2.5	2.5	1.52	1.52	1.52
24	24	27.9	14	4.643	4.36	2.9	2.9	2.9	2.75	1.667	1.667	1.667
26	26	29.75	14	-	4.643	2.955	2.955	2.955	2.955	1.711	1.711	1.711
28	28	32	14	-	5	3.182	3.182	3.182	3.182	1.842	1.842	1.842
30	30	34	14	-	5.357	3.409	3.409	3.409	3.409	1.974	1.974	1.974
32	32	36.125	14	-	5.714	3.636	3.636	3.636	3.636	2.105	2.105	2.105
34	34	38.125	14	-	6.071	3.864	3.864	3.864	3.864	2.237	2.237	2.237
36	36	40.5	14	-	6.429	4.091	4.091	4.091	4.091	2.368	2.368	2.368
42	42	47.125	21	-	-	4.772	4.773	4.773	4.773	2.763	2.763	2.763
48	48	53.5	21	-	-	5.455	5.455	5.455	5.455	3.158	3.158	3.158
54	54	59.625	21	-	-	-	-	-	-	3.553	3.553	3.553
63	62.99	66.79	21	-	-	-	-	-	-	4.145	4.145	4.145

For reference only. Actual dimensions may vary.
Solo para referencia. Las dimensiones reales pueden variar.

TRANSITION FITTING HDPE TO MALE THREADED METAL

Accesorio Transición HDPE A Macho Roscado



DR	17	11	9	7
Pressure Rating Resistencia a la Presión	125 psi	200 psi	250 psi	333 psi

Nominal Size (in) Tamaño nominal	Actual OD (in) DE Actual	A (in)	B (in)	L (in)
½	0.840	1.6	6.4	8
¾	1.050	1.8	6.2	8
1	1.315	2	4.25	6.25
1¼	1.660	2.5	6.75	9.25
1½	1.900	2.5	6.75	9.25
2	2.375	3	6.25	9.25
3	3.500	4	5.25	9.25
4	4.500	4	5.25	9.25
6	6.625	5	7	12
8	8.625	7.0	8.0	15
10	10.750	8.0	8.0	16
12	12.750	9.0	9.0	18

1. Available in Brass, Carbon Steel (Epoxy Coated), 304 and 316 Stainless Steel

1. Disponible en bronce, acero al carbono recubierto con Epoxy y acero inoxidable 304 y 316.

HDPE PIPE SIZES
IPS PE3608 AND PE4710

Tamaños HDPE tuberías
IPS PE3608 y PE4710

DR		11			13.5			15.5		
PE3608 Pressure Rating Resistencia a la Presión		160 psi			128 psi			110 psi		
PE4710 Pressure Rating Resistencia a la Presión		200 psi			160 psi			138 psi		
Nom. OD DE Nominal (in)	Actual OD DE Actual (in)	Min Wall Espesor Mínimo de Pared (in)	Avg ID DI Promedio (in)	Weight Peso (lb/ft)	Min Wall Espesor Mínimo de Pared (in)	Avg ID DI Promedio (in)	Weight Peso (lb/ft)	Min Wall Espesor Mínimo de Pared (in)	Avg ID DI Promedio (in)	Weight Peso (lb/ft)
¾	1.05	0.095	0.848	0.13	---	---	---	---	---	---
1	1.32	0.12	1.062	0.2	---	---	---	---	---	---
1¼	1.66	0.151	1.34	0.314	---	---	---	---	---	---
1½	1.9	0.173	1.534	0.411	---	---	---	---	---	---
2	2.38	0.216	1.917	0.642	0.176	2.002	0.534	0.153	2.05	0.47
3	3.5	0.318	2.825	1.395	0.259	2.95	1.16	0.226	3.021	1.02
4	4.5	0.409	3.633	2.31	0.333	3.793	1.92	0.29	3.885	1.687
5	5.375	0.489	4.339	3.29	0.398	4.531	2.73	0.347	4.64	2.4
5	5.563	0.506	4.491	3.523	0.412	4.689	2.928	0.359	4.802	2.58
6	6.625	0.602	5.348	5	0.491	5.585	4.152	0.427	5.719	3.656
7	7.125	0.648	5.752	5.78	0.528	6.006	4.8	0.46	6.15	4.21
8	8.625	0.784	6.963	8.47	0.639	7.271	7.04	0.556	7.445	6.197
10	10.75	0.977	8.678	13.16	0.796	9.062	10.932	0.694	9.28	9.626
12	12.75	1.159	10.293	18.51	0.944	10.748	15.38	0.823	11.006	13.53
14	14	1.273	11.302	22.32	1.037	11.801	18.54	0.903	12.085	16.31
16	16	1.455	12.916	29.15	1.185	13.487	24.22	1.032	13.812	21.3
18	18	1.636	14.531	36.89	1.333	15.173	30.651	1.161	15.538	26.95
20	20	1.818	16.145	45.541	1.481	16.859	37.84	1.29	17.265	33.28
22	22	2	17.76	55.105	1.63	18.545	45.79	1.419	18.991	39.712
24	24	2.182	19.375	65.58	1.778	20.231	54.49	1.548	20.717	47.92
26	26	2.364	20.989	77.44	1.926	21.917	64.261	1.677	22.444	56.532
28	28	2.545	22.604	89.785	2.074	23.603	74.522	1.806	24.17	65.563
30	30	2.727	24.218	103.076	2.222	25.289	85.543	1.935	25.897	75.264
32	32	2.909	25.833	117.285	2.37	26.975	97.324	2.065	27.623	85.672
34	34	3.091	27.447	132.411	2.519	28.661	109.905	2.194	29.35	96.714
36	36	3.273	29.062	148.454	2.667	30.347	123.208	2.323	31.076	108.424
42	42	---	---	---	3.111	35.404	167.675	2.71	36.255	147.568
48	48	---	---	---	---	---	---	3.097	41.435	192.774
54	54	---	---	---	---	---	---	3.484	46.614	243.921
63	62.99	---	---	---	---	---	---	---	---	---
65	65	---	---	---	---	---	---	---	---	---

1. Pressures are based on using water at 23°C (73°F).
2. Average inside diameter calculated using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary.
3. Other piping sizes or DR's may be available upon request.
4. Standard Lengths:
   - 40' for 2"-24"
   - 50' for 26" and larger
   - Coils available for ¾ - 4" (6" by special order)

1. Las presiones están basadas en el uso de agua a 23°C (73°F)
2. El diámetro interno promedio calculado el diámetro externo nominal y la pared mínima más 6% para uso la estimación de flujos de fluidos. El diámetro interno real variará.
3. Otros tamaños o DR de tubería pueden estar disponibles bajo pedido.
4. Longitudes estándar
   - 40 pies para 2 -24 pulgadas
   - 50 pies para 26 pulgadas o mayores
   - Bobinas disponibles para ¾ a 6 pulgadas (8 pulgadas para pedidos especiales)

LYALL®

WATER APPLICATION

LYALL-POLYTEC
POLYETHYLENE BALL VALVES

California Office
2665 Research Dr.
Corona, CA 92882

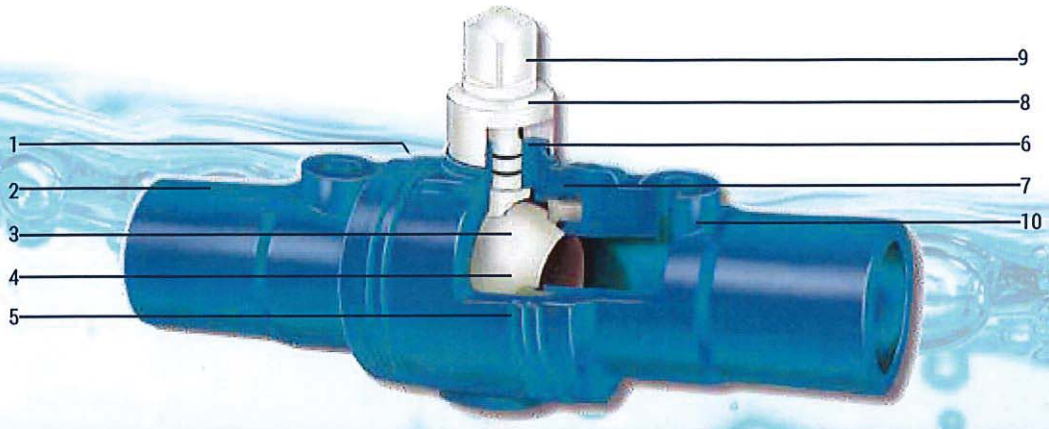
Wisconsin Office
16875 West Ryerson Rd.
New Berlin, WI 53151

Customer Service
(800) 535-9255

RWLyall.com

Lyall Polytec Ball Valves provide high performance applications to the following areas:

- Water
- Agriculture
- Irrigation
- Sewer



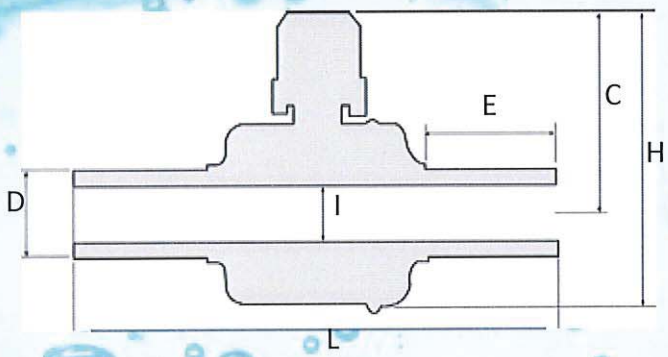
No	Component	Material	Operating Feature
1	Body	Polyethylene	PE 4710 (PE100)
2	End	Polyethylene	PE 4710 (PE100)
3	Ball	Acetal/Polypropylene*	Excellent strength and thermal resistance
4	Retainer	Polypropylene	Positive seal under any condition. Retains seat under high differential pressure.
5	Ball Seat	Nitrile (NBR)	Reliable sealing from -20° F to 140° F
6	Stem	Acetal	Excellent durability and strength
7	Stem Seal	Nitrile (NBR)	Redundant sealing with dual O-rings
8	Weather Seal	Nitrile (NBR)	Protects from ground water and dirt.
9	Operater Nut	Polypropylene	2 inch (50mm) square or hexagon
10	Purge Connector	Polyethylene	Integral easy-purge connection

** 2 IPS (RP) valves and smaller = Acetal 2 IPS (FP) valves and larger = Polypropylene*

Item	Operating Feature
Sizes	All standard 1/2 through 1-1/4 CTS and 1/2 through 16 IPS and 20 mm through 400 mm metric sizes
Design/Testing	ASME B16.40, AWWA C901, AWWA C906
Materials	High Density PE 4710
Operating Pressure (SDR 11)	200 PSI (PE4710)
Temperature	32° F to 140° F / 0° C to 60° C
Bore	Standard (Reduced) Port and Full Port
Pipe Connection	Butt Fusion, Socket Fusion, Electrofusion or LYCOFIT® Mechanical Fittings (up to 2 IPS)
Operation	90 degree operating standard (360° optional in 2 IPS ONLY)
Valve Boxes	Supported by all leading valve box manufacturers.

SMALL BODY PE VALVES

High Density PE 4710



CTS Valve Sizes and Dimensions (approx)

Nominal Valve Size	D inch/mm	L inch/mm	H inch/mm	C inch/mm	I inch/mm	Port	Cv	E inch/mm	Weight lbs/kg
1/2 CTS	0.625 / 15.9	11.50 / 292	5.12 / 130	3.70 / 94	1.06 / 27	Full	9	3.62 / 92	0.97 / 0.44
1 CTS	1.125 / 28.6	11.50 / 292	5.12 / 130	3.70 / 94	1.06 / 27	Full	36	3.62 / 92	1.01 / 0.46
1-1/4 CTS	1.375 / 34.9	11.50 / 292	5.12 / 130	3.70 / 94	1.06 / 27	Full	55	3.62 / 92	1.00 / 0.46

All CTS valve sizes are available in a full range of wall thicknesses. Contact your Lyall representative for available ISO and other metric sizes.

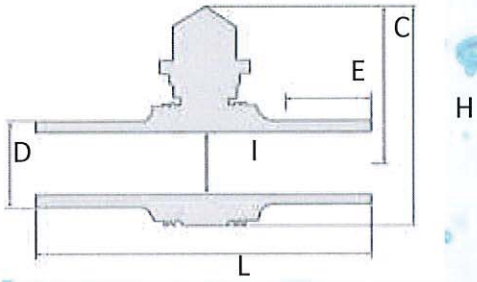
IPS Valve Sizes and Dimensions (approx)

Nominal Valve Size	D inch/mm	L inch/mm	H inch/mm	C inch/mm	I inch/mm	Port	Cv	E inch/mm	Weight lbs/kg
1/2 IPS / SDR 9.3	0.840 / 21.3	11.50 / 292	5.12 / 130	3.70 / 94	1.06 / 27	Full	20	3.62 / 92	0.97 / 0.44
3/4 IPS / SDR 11	1.050 / 26.7	11.50 / 292	5.12 / 130	3.70 / 94	1.06 / 27	Full	32	3.62 / 92	0.99 / 0.45
1 IPS / SDR 11	1.315 / 33.4	11.50 / 292	5.12 / 130	3.70 / 94	1.06 / 27	Full	50	3.62 / 92	1.01 / 0.46
1-1/4 IPS / SDR 11	1.660 / 42.1	11.50 / 292	5.12 / 130	3.70 / 94	1.06 / 27	Std	79	3.62 / 92	1.01 / 0.46
1-1/2 IPS / SDR 11	1.900 / 48.3	12.20 / 310	5.51 / 140	3.78 / 96	1.26 / 32	Std	104	2.80 / 71	1.80 / 0.80
2 IPS	2.375 / 60.3	12.20 / 310	5.51 / 140	3.78 / 96	1.38 / 35	Std	118	3.31 / 84	1.90 / 0.86

Where applicable, other SDR's are available upon request. Contact your Lyall representative for available ISO and other metric sizes.

LARGE BODY PE VALVES

High Density PE 4710



IPS Valve Sizes and Dimensions (approx)

Nominal Valve Size	D inch/mm	L inch/mm	H inch/mm	C inch/mm	I inch/mm	Port	Cv	E inch/mm	Weight lbs/kg
2 IPS / SDR 11	2.37 / 60.3	19.60 / 498	9.65 / 250	7.01 / 178	1.77 / 45	Full	164	6.69 / 170	4.19 / 1.90
3 IPS / SDR 11	3.50 / 88.9	21.29 / 541	12.00 / 305	8.50 / 216	2.52 / 64	Full	375	6.69 / 170	8.60 / 3.90
4 IPS / SDR 11	4.50 / 114.3	21.29 / 541	12.00 / 305	8.50 / 216	2.52 / 64	Std	407	6.69 / 170	9.70 / 4.40
4 IPS / SDR 11	4.50 / 114.3	24.02 / 610	14.92 / 381	10.39 / 264	3.58 / 91	Full	591	6.69 / 170	18.52 / 8.40
6 IPS / SDR 11	6.62 / 168.3	24.02 / 610	14.92 / 381	10.39 / 264	3.58 / 91	Std	854	6.69 / 170	22.27 / 10.1
6 IPS / SDR 11	6.62 / 168.3	26.18 / 665	18.94 / 485	13.03 / 331	4.80 / 122	Full	1280	6.69 / 170	38.36 / 17.4
8 IPS / SDR 11	8.62 / 219.1	30.12 / 765	24.80 / 630	16.57 / 421	6.69 / 170	Full	2146	6.69 / 170	91.49 / 41.5
10 IPS / SDR 11	10.75 / 273.0	30.12 / 765	24.80 / 630	16.57 / 421	7.95 / 202	Full	3074	6.69 / 170	97.22 / 44.1
12 IPS / SDR 11	12.75 / 323.8	30.12 / 765	24.80 / 630	16.57 / 421	7.95 / 202	Full	3645	6.69 / 170	100.75 / 75.70
14 IPS / SDR 11	14.00 / 355.6	35.83 / 910	31.18 / 805	19.33 / 491	11.38 / 289	Full	5736	6.69 / 170	248.02 / 112.5
16 IPS / SDR 11	16.00 / 406.4	35.86 / 910	31.18 / 805	19.33 / 491	11.38 / 289	Full	6559	6.69 / 170	256.40 / 116.3

Where applicable, other SDR's are available upon request. Contact your Lyall representative for available ISO and other metric sizes.

ADDITIONAL VALVE OPTIONS

Stem Extensions

Purge/Bypass Ports

High Differential Bypass
(Standard in 12", 14" and 16" sizes)

Factory Fused PE Pups

TRACKING & TRACEABILITY

Lyall has been a leader in the development and standardization of the Tracking & Traceability encoding system. In fact, in 2012 we began shipping gas pressure carrying components marked with the 16 character identifier as published in ASTM F2897. As such, all Lyall Polytec valves include a 2D-QR-Bar Code that when scanned with decoding software will provide:

- Manufacturer
- Manufacturer Lot Code
- Production Date
- Component Material
- Component Type
- Component Size

SUMMARY OF VALIDATION TESTING

Each valve is designed in accordance with AWWA C901 & 906 with guidance from ASME B16.40. Lyall, Polytec, and third party labs conduct testing under these specifications as well as other supplemental tests as follows:

SHELL TEST

Each valve is tested at both 4 PSIg and 1.5 x design pressure to verify the pressure boundary integrity of the valve shell.

SEAT TEST

Each valve seat (since the Lyall-Polytec valve is a bi-directional valve, both seats are tested) is tested at 4 PSIg and 1.5 x design pressure to verify the pressure containing ability of the valve closure and seat seals.

SUSTAINED PRESSURE VERIFICATION

Testing is conducted at a temperature of 176°F at 580 psi for 1,000 hours.

PRESSURE BOUNDARY VERIFICATION

This test is designed to verify the basic pressure boundary integrity of the valve shell. ASME B16.40 requires this test to be performed at 176°F for 1,000 hours.

CLOSURE VERIFICATION

This test is designed to verify the structural integrity and pressure retention capability of the valve closure element (ball). The valve is closed and the inlet pressurized at 1.1 x design pressure for 170 hours at 176°F or 1,000 hours at 100°F. The outlet is open to atmosphere.

TEMPERATURE RESISTANCE

This test is designed to verify that the valve will perform properly over the temperature range of -20° F to 140° F. The valve is first cooled to -20° F, operated against a differential pressure equal to the design pressure, and subjected to shell and seat leakage tests while at -20° F. The valve temperature is then raised to 140° F and the above process is repeated. In addition to operating properly and not leaking, the valve operating torque must not exceed specified limits at both temperatures.

FLOW TEST

This test is performed to verify that each valve design has at least the specified minimum flow capacity (Cv) in accordance with ASME B16.40.

Note: Cv values presented within this document are the typical values of Lyall-Polytec valves and are based upon the mathematical equation set forth by ASME B16.40. All Lyall-Polytec valves far exceed the minimum requirement set forth by ASME B16.40. Please contact your Lyall representative for a complete Test Data Package (TDP) that includes more detail on the testing that was performed.

SUPPLEMENTAL TESTING

In addition, the following tests were conducted to ensure that the product performance exceeds our customers' requirements.

IMPACT TEST

Each valve is subjected to impact testing at temperatures of 0° F and 100° F. A twenty pound weight with a special TUP is dropped from a height of three feet on the valce actuator, a total of five times. This test is performed at both temperatures. The valve must continue to operate properly and pass the basic valve shell and seat tests after the impacts.

TENSILE TEST

Each valve is subjected to a tensile test at loads which would create in the attached pipe either a 25% elongation or elongation equal to that caused by thermal expansion due to 100° temperature change. The valve must remain operable and not leak during or after this test.

CYCLE TEST

Each valve is tested for 1,000 cycles. The valves are opened each cycle against a 100 psig pressure differential. At the conclusion, each valve must pass the basic shell and seat tests.

Note: All Lyall-Polytec valves far exceed the minimum requirements set forth by ASME B16.40, AWWA C901 and AWWA C906. Please contact your Lyall representative for a complete Test Data Package (TDP) that includes more detail on the testing that was performed.

LYALL®

POLYTEC BALL VALVES for Water Application

- Meets or exceeds ASME B16.40, AWWA C901, AWWA C906
- Each valve includes material Tracking & Traceablity coding per ASTM F2897.
- All product manufactured in an ISO 9001 certified facility.
- Maximized flow for optimal performance.
- Service rated to maximum allowable pressures.
- Precision manufacturing processes ensure lower operating torque.
- Bubble-tight seal throughout entire pressure and temperature range.
- Specially compounded nitrile seals (NBR) exceed industry standards.
- Valve body design provides resistance to mechanical and thermal loads making it the strongest part of a PE piping system.

California Office
2665 Research Dr.
Corona, CA 92882

Wisconsin Office
16875 West Ryerson Rd.
New Berlin, WI 53151

LIT-BVWATERDS-1116

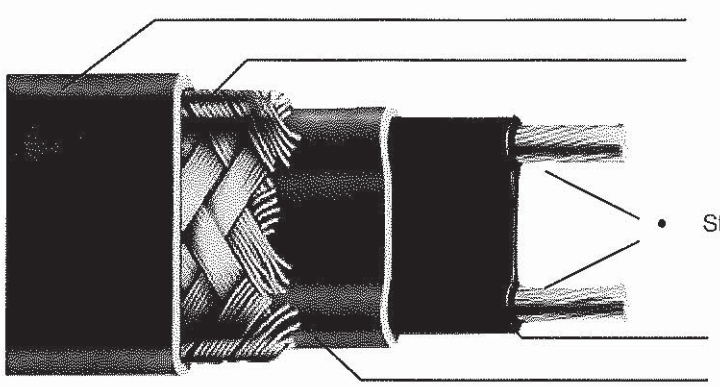
Customer Service
(800) 535-9255

RWLyall.com

NELSON™

SPECIFICATION/APPLICATION INFORMATION

CLT SELF-REGULATING HEATERS



- Standard Overjacket
- Standard Metal Braid
- Stranded Copper Conductors
- Self Regulating Conductive Core
- Thermoplastic Elastomer Jacket

CLT3-JT CLT23-JT
CLT5-JT CLT25-JT
CLT8-JT CLT28-JT

Description:

Nelson Type CLT self-regulating heater cable is a parallel circuit electric heater strip. An irradiation cross-linked conductive polymer core material is extruded over the multi-stranded, tin-plated, 18-guage copper bus wires. The conductive core material increases or decreases its heat output in response to temperature changes. A thermoplastic elastomer dielectric jacket is then extruded over the conductive core. A copper braid is installed over this jacket providing a continuous ground path. A UV stabilized thermoplastic elastomer overjacket is provided to cover the braid for wet applications and exposure to the sun.

Principle of Operation:

The parallel bus wires apply voltage along the entire length of the heater cable. The conductive core provides an infinite number of parallel conductive paths permitting the cable to be cut to any length in the field with no dead or cold zones developing. The heater cable derives its self-regulating characteristic from the inherent properties of the conductive core material. As the core material temperature increases, the number of conductive paths in the core material decrease, automatically decreasing the heat output. As the temperature decreases, the number of conductive paths increase, causing the heat output to increase. This occurs at every point along the length of the cable, adjusting the power output to the varying conditions along the pipe.

The self-regulating effect allows the cable to be overlapped without creating hot spots or burnout. As the cable self-regulates it heat output, it provides for the efficient use of electric power, producing heat only when and where it is needed, and also limiting the maximum surface temperature.

Application:

Nelson's Type CLT self-regulating heater cable is ideal for use in maintaining fluid flow under low ambient conditions. Freeze protection and low watt density process temperature systems such as pipelines, fire protection, process water, dust suppression systems, hot water and structure anti-icing are typical applications for this product.

For other than metal pipe heating, see appropriate application guide.

The base product is supplied with a copper metal braid with a thermoplastic elastomer overjacket for wet applications, exposure to the sun, and where mechanical abuse is a problem.

Performance and Rating Data:

Catalog Number	Service Voltage	Maximum Length	Maximum Maintenance Temperature	Maximum Intermittent Exposure
CLT3	120	221	150°F (65°C)	185°F (85°C)
CLT23	240	533	150°F (65°C)	185°F (85°C)
CLT5	120	178	150°F (65°C)	185°F (85°C)
CLT25	240	458	150°F (65°C)	185°F (85°C)
CLT8	120	142	150°F (65°C)	185°F (85°C)
CLT28	240	347	150°F (65°C)	185°F (85°C)

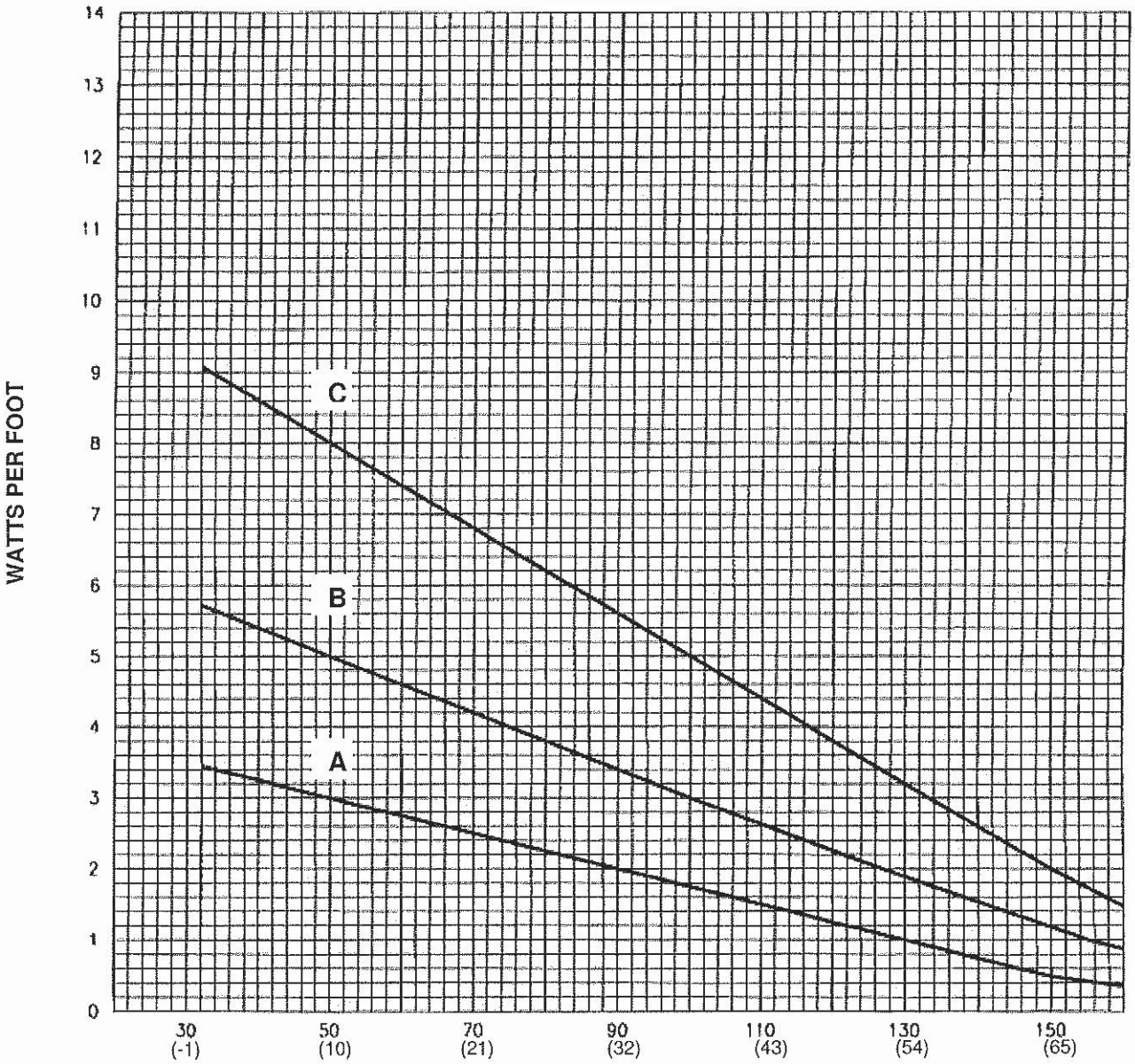
Circuit Breaker Selection:

Watt/Ft	Start-Up Temp.	Max. Length (Feet) Vs. Circuit Breaker Size					
		120 Volt			240 Volt		
		15A	20A	30A	15A	20A	30A
3	50°F (10°C)	221	---	---	533	---	---
	0°F (-18°C)	208	221	---	416	533	---
	-20°F (-29°C)	187	221	---	374	499	533
5	50°F (10°C)	178	---	---	413	458	---
	0°F (-18°C)	150	178	---	299	399	458
	-20°F (-29°C)	135	178	---	269	359	458
8	50°F (10°C)	142	---	---	289	347	---
	0°F (-18°C)	105	140	142	210	280	347
	-20°F (-29°C)	95	127	142	190	253	347

NOTES:

1. Circuit breakers are sized per national electrical codes.
2. When using 240 volt product at 208, 220 or 277 volts, use the circuit adjustment factors shown in the Voltage Adjustment Table.
3. When using 2 or more heater cables of different wattage ratings in parallel on a single circuit breaker, use the 15A column amperage of 15 amps, divide it by the maximum footage to arrive at an amps/foot figure for each cable. You can then calculate circuit breaker sizes for these combination loads. These amps/foot factors include the 125% sizing factor.
4. National electrical codes require ground-fault equipment protection for each branch circuit supplying electric heating equipment.

Power Output Rating:



A CLT3, CLT23 B CLT5, CLT25 C CLT8, CLT28

WATTS PER FOOT X 3.28 = WATTS PER METER

PIPE TEMPERATURE °F CONVERSION TO °C = 5/9 (°F-32)

NELSON™

SPECIFICATION/APPLICATION INFORMATION

CLT SELF-REGULATING HEATERS

Catalog Numbers:

BASIC CATALOG NUMBERS			
Voltage	Watts Per Foot		
	3	5	8
120 VAC	CLT3	CLT5	CLT8
240 VAC	CLT23	CLT25	CLT28

Standard Feature Suffix:

-JT Copper Braid and Thermoplastic Elastomer Overjacket

Voltage Adjustment:

Use of products at other than nominal voltages requires minor adjustments in power and maximum circuit lengths.

ADJUSTMENT MULTIPLIER							
	208 VAC		220 VAC		277 VAC		Absolute
Product	Power	Length	Power	Length	Power	Length	Max Length
CLT23	.71	1.04	.81	1.02	1.34	.98	533 ft.
CLT25	.80	1.01	.87	1.00	1.22	1.02	458 ft.
CLT28	.87	1.00	.92	1.00	1.12	1.03	347 ft.

Approvals:

CSA
Ordinary Locations-

UL
Ordinary Locations-

c UL us LISTED

Accessories:

- Connection Kits for Power Connection, Tee Splice, Splices and End Seals (Nelson PLT Series)
- Thermostatic Controls (Nelson TA, TH, TE and HC Series)
- Junction Boxes, Tapes and Warning Signs
- Custom Control, Monitoring and Power Panels

Nelson Heat Tracing Systems products are supplied with a limited warranty. Complete Terms and Conditions may be found on Nelson's website at www.nelsonheaters.com.

NELSON HEAT TRACE
P.O. BOX 726 • TULSA, OK 74101 • 918-627-5530 • FAX 918-641-7336 • www.nelsonheaters.com

EMERSON. Industrial Automation

315-SA-030
February 2009

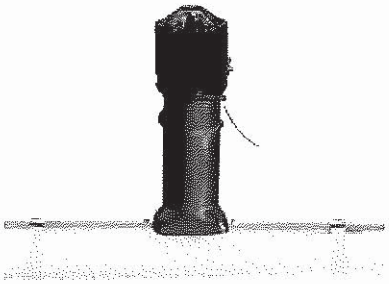
Lighted End of Circuit Termination Kit

CSA:
Class I, Division 2, Groups B, C, D
Class II, Groups E, F, G (Canada Only)
Class III (Canada Only)
Enclosure Type 4X, Temperature Code T6 – T3
Class 1 Zone 1; Ex e II; T6 – T3 ①

FM:
Class I, Division 2, Groups B, C, D
Class II, Groups E, F, G; Class III
Enclosure Type 4X, IP66, Temperature Code T ①
Class 1 Zone 1; AEx e IIC T
-40°C ≤ Tamb ≤ 55°C

Applications

- The HEL100 Lighted End of Circuit Termination Kit is designed for terminating one heater cable with a non-directional lens assembly and long life LED output
- Kits are used to connect and terminate Nelson self-regulating heater cable series LT-J, LT-JT, QLT-J, HLT-J, XLT-J and CLT-JT ②



Features

- Global-reach industrial-grade universal connection kits for Hazardous Locations
- Certified for NEC/CEC (AX Series) and IEC (EX Series) installations
- Incorporate rugged, non-metallic construction rated for IP66 / NEMA 4X
- Designed with corrosion resistant, antistatic enclosures and components
- Fit all wattages of Nelson LT-J, LT-JT, QLT-J, HLT-J, XLT-J and CLT-JT series self-regulating heater cables
- Min Installation Temp: -40°C (-40°F)
- Temp Use Range: -50°C to +55°C (-58°F to 131°F) ambient
- Conductor Size: 1 mm² (18 AWG) to 6 mm² (8 AWG)
- Voltage Range: 300 Vac Maximum
- Ingress Protection: NEMA 4X, IP66
- Max Amperage: 14 A CLT Series, 18 A LT, QLT, HLT Series, 25 A XLT Series
- Enclosure Material: Glass reinforced, carbon-loaded, polyester, UV resistant, polymer
- Weight:0.4 kg (0.8 lb)

Accessories

- Pipe clamp to secure standoff to pipe (one is included in each kit):
  - PC03 – 80 mm (3 in) and smaller pipe
  - PC12 – 80 mm (3 in) to 12 inch (300 mm) pipe
  - PC20 – 300 mm (12 in) to 20 inch (500 mm) pipe
- Small pipe adaptor: HC-SPA – 25 mm (1.0 in) and smaller pipe

Ordering Information

- One kit should be ordered for each type of connection needed
- A pipe clamp of the appropriate size for the pipe must be selected (-3 for PC03, -12 for PC12, -20 for PC20) for each connection kit
- A small pipe adaptor kit must be ordered for each kit for installation on 25mm (1") or smaller pipe

① *For temperature code, see heating cable or design information*
② *Ordinary Location Only*

NELSON HEAT TRACE

Lighted End of Circuit Termination Kit

CSA:
Class I, Division 2, Groups B, C, D
Class II, Groups E, F, G (Canada Only)
Class III (Canada Only)
Enclosure Type 4X, Temperature Code T6 – T3
Class 1 Zone 1; Ex e II; T6 – T3 ①

FM:
Class I, Division 2, Groups B, C, D
Class II, Groups E, F, G; Class III
Enclosure Type 4X, IP66, Temperature Code T ①
Class 1 Zone 1; AEx e IIC T
-40°C ≤ Tamb ≤ 55°C

Selection Table

Kit Contents	HEL100
Lighted End Cap	1
Standoff	1
Silicone Power Termination Fitting	1
Silicone Adhesive	1
Cable Grommet	1
Locknut	1
Cable Tie	1

Johns Manville

Micro-Lok® *HP*

High-Performance Fiber Glass Pipe Insulation

DESCRIPTION

Micro-Lok *HP* Fiber Glass Pipe Insulation is a high-performance insulation made from rotary glass fibers bonded with a thermosetting resin and produced in 36" (0.92 m) lengths. Micro-Lok *HP* insulation is used to insulate standard iron pipe and copper tubing. The 3' (0.92 m) sections are available plain or with a factory-applied vapor-barrier jacket. The all-service (ASJ) vapor-retarder jacket includes a longitudinal, self-sealing closure lap. The jacket system is adhered to each fiber glass section using a specially formulated adhesive to ensure jacket securement.

The factory-installed tape system permits installation at ambient temperatures down to 20°F (-7°C) and will not soften or separate when exposed to high ambient temperatures and humidity.

USES

Micro-Lok *HP* fiber glass pipe insulation is suitable for installation over hot, cold, concealed and exposed piping systems with operating temperatures up to 850°F (454°C). Weather-protective jacketing is required for outdoor applications. Pipes operating below ambient temperatures require all joints to be sealed with the factory-applied, self-seal lap and butt strips.

PHYSICAL PROPERTIES

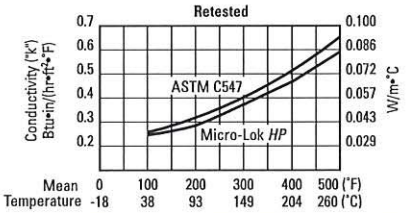
Service Temp. Range (ASTM C411)	0°F to 850°F (-18°C to 454°C)
Moisture Sorption	<5% by weight
Alkalinity	<0.6% expressed as Na_2O
Corrosivity (ASTM C665)	Does not accelerate
Capillarity	Negligible (after 24 hours)
Shrinkage (ASTM C356)	None
Microbial Growth (ASTM C1338)	Does not promote microbial growth
Surface Burning Characteristics	Composite FHC 25/50 per ASTM E84, NFPA 255, CAN/ULC S102.2
Limited Combustibility	NFPA 90A and 90B
Jacketing	ASTM C1136 (Type I)
Water Vapor Permeance (ASTM E96 – Procedure A)	0.02 perms max.
Burst Strength (ASTM D774)	55 lbs/in² (4.6 Kg/cm²)
Tensile Strength (ASTM D828)	45 lbs./in. (7.9N/mm) width min. (MD) 30 lbs./in. (5.23N/mm) width min. (CD)

Operating Temperature Limits: 0°F to 850°F (-18°C to 454°C)

SPECIFICATION COMPLIANCE

- ASTM C547 Type I (Replaces HH-I-558B, Form D, Type III, Class 12, Class 13 up to 850°F [454°C])
- ASTM C585 – Dimension Standard
- ASTM C1136 (Jacketing) (Replaces HH-B-100B, Type I & II)
- MIL-I-22344D, MIL-PRF-22344E
- NRC 1.36, ASTM C795, MIL-I-24244C, MIL-DTL-24244D
- Coast Guard/IMO Approved 164.109/56/0 (plain, unjacketed only – excluding ⅞ x ½ [22 mm x 13 mm], ½ x ½ [13 mm x 13 mm])
- MEA compliant
- California Bureau of Home Furnishings and Thermal Insulation – Registry Number CA-T040 (CO)
- Firestop Assemblies: Meets requirement for jacketed fiber glass pipe insulation product density at or above 3.5 pcf.
- ASTM E84, CAN ULC S102.2 – 25/50 listed and labeled Intertek testing laboratories

THERMAL CONDUCTIVITY ("K") *



Mean Temperature	°F	75	100	200	300	400	500
	°C	24	38	93	149	204	260
Btu•in/(hr•ft²•°F)		0.23	0.24	0.28	0.34	0.44	0.55
W/m•°C		0.034	0.035	0.040	0.049	0.063	0.079

* Apparent thermal conductivity values are determined by applying procedures dictated per ASTM C1045 on test data obtained using ASTM Test Method C335. All values are based on nominal manufacturing and testing parameters, are subject to normal variation, and are not guaranteed for specification purposes or otherwise.

GREEN BUILDING ATTRIBUTES

Manufacturing Location	Defiance, Ohio (43512)	
Recycled Content (glass only)	41%	
Recycled Content (total product)	33%	
Volatile Organic Compounds (ASTM D5116) (Analysis ASTM D6196 & ASTM D5197)	Total	0.15 g/l
Fiber Glass Pipe Insulation	Formaldehyde	0.009 ppm
	Aldehydes	0.009 ppm
Volatile Organic Compounds (Calculated)	Total	<49 g/l
Self-Sealing Lap & Butt Strips		

GREEN BUILDING CERTIFICATIONS

GREENGUARD®	Certified
GREENGUARD® GOLD	Certified
LEED® Credits	
LEED-NC	See JM.com/buildgreen JM LEED Credit Guide (HIG-1231)

GREENGUARD® Certified products have been screened for more than 10,000 volatile organic compounds (VOCs) and meet stringent standards for low chemical emissions based on established criteria from key public health agencies.

Micro-Lok® *HP*

High-Performance Fiber Glass Pipe Insulation

SIZE AVAILABILITY

Insulation Thickness		Iron Pipe Size Range		Copper Tubing Size Range	
in.	mm	in.	mm	in.	mm
½	13	½–6	13–152	⅝–4⅛[§]	16–105
1	25	½–24	13–610	⅝–6⅛	16–156
1½	38	½–24	13–610	⅝–6⅛	16–156
2	51	½–24	13–610	1⅛–6⅛	29–156
2½	64	1–24	25–610	1⅜–6⅛	35–156
3	76	1–24	25–610	1⅜–6⅛	35–156
3½	89	1½–24[*]	38–610	–	–
4	102	3–24[**]	76–610	–	–
4½	114	3–24[†]	76–610	–	–
5	127	3–20[††]	76–508	–	–

Notes:

**2½" and 23" IPS not available in this insulation thickness.*

***22" and 23" IPS not available in this insulation thickness.*

†21," 22" and 23" IPS not available in this insulation thickness.

††19" IPS not available in this insulation thickness.

§3⅝" CTS not available in this insulation thickness.

QUALIFICATIONS FOR USE

A sufficient thickness of insulation must be used to keep the maximum surface temperature of Micro-Lok *HP* insulation below 150°F (66°C). In addition, at operating temperatures above 500°F (260°C), Micro-Lok *HP* pipe insulation must be applied in a thickness ranging from 2" (51 mm) minimum to 6" (152 mm) maximum.

During initial heat-up to operating temperatures above 350°F (177°C), an acrid odor and some smoke may be given off as the organic binders used in the fiber glass pipe insulation begin to decompose. When this occurs, caution should be exercised to ventilate the area well. This loss of binder does not directly affect the thermal performance of the pipe insulation, but the compressive strength and resiliency of the product are reduced. For applications with excessive physical abuse or vibration at high temperatures, consult your local Insulation Systems Market Development Manager for alternate material recommendations.

CHILLED WATER SYSTEMS

For chilled water systems, see Chilled Water InsulSpec™ – 3-Part Specification, MECH-239.

APPLICATION RECOMMENDATIONS*

MICRO-LOK *HP* PIPE INSULATION AND BUTT STRIPS

1. Do not apply Micro-Lok *HP* insulation if air temperature is below 20°F (-7°C) or above 130°F (54°C) due to the effect of temperature on tape performance. We recommend stapling when application falls outside this temperature range.

When stapling, we recommend mastic be applied over staples to prevent moisture penetration.

2. If stored below 20°F (-7°C) or above 130°F (54°C), insulation cartons should stand within the recommended temperature range for 24 hours prior to application.

3. Once release paper is removed, both adhesive and lap must be kept free of dirt and water, and the lap sealed immediately.

4. When adhered, the lap and butt strips must be pressurized by rubbing firmly with a plastic squeegee or the back of a knife blade to ensure positive closure.

**For complete application recommendations and installation instructions, see MECH-238 and MECH-239 InsulSpec Specifications.*

Johns Manville

717 17th St.
Denver, CO 80202
800-654-3103
www.JM.com

North American Sales Offices, Insulation Systems

Eastern Region
P.O. Box 158
Defiance, OH 43512
(800) 334-2399
Fax: (419) 784-7866

Western Region & Canada
P.O. Box 5108
Denver, CO 80217
(800) 368-4431
Fax: (303) 978-4661

MECH-228 02/20/17 (Replaces 11/09/16)

Aluminum Roll Jacketing

www.gltproducts.com

SPECIFICATIONS

Aluminum Roll Jacketing is the premier protective outer surface for mechanical insulation systems including pipe, vessels, and equipment. It protects the insulation and underlying pipes/vessels from physical damage, UV exposure, corrosive atmospheres, and water.

Available Surface Finishes:
- Stucco embossed
- Smooth

Compliance Standards:
- ASTM Aluminum Jacket standard C1729
- ASTM B209 (Aluminum Alloy Standard)

Aluminum Roll Jacketing (also called cladding) is available in smooth, stucco embossed, and 3/16 corrugated (cross-crimped) finishes. For larger surfaces, box-rib and deep corrugated sheets are also available. Aluminum Roll Jacketing has a bare outer surface and comes standard with a 3 mil thick polyfilm moisture barrier heat-laminated to the interior surface to help prevent corrosion of the jacketing and the underlying metal pipe, vessel, or equipment.

Aluminum Roll Jacketing is typically manufactured using alloys 3105 or 3003 which have very similar composition and performance and are considered interchangeable for use as insulation jacketing. Both bare and polysurlyn lined Aluminum Roll Jacketing comply with the requirements of the ASTM Aluminum Jacketing Material standard, C1729, Type 1, which includes the strength and chemical composition requirements for compliance to ASTM B209 (Aluminum Alloy Standard).

Recommended Uses

Aluminum Roll Jacketing is recommended for use in all of the following Insulation system applications:

- Standard outdoor use on all pipe and vessel insulation systems up to 8 ft. outer diameter
- Indoor insulation system applications up to 8 ft. outer diameter where increased damage resistance is desired

Recommended Thicknesses

The thickness of Aluminum Roll Jacketing may vary based on the outer diameter of the insulation system per the requirements of ASTM C1729. This recommended thickness is shown in the table.

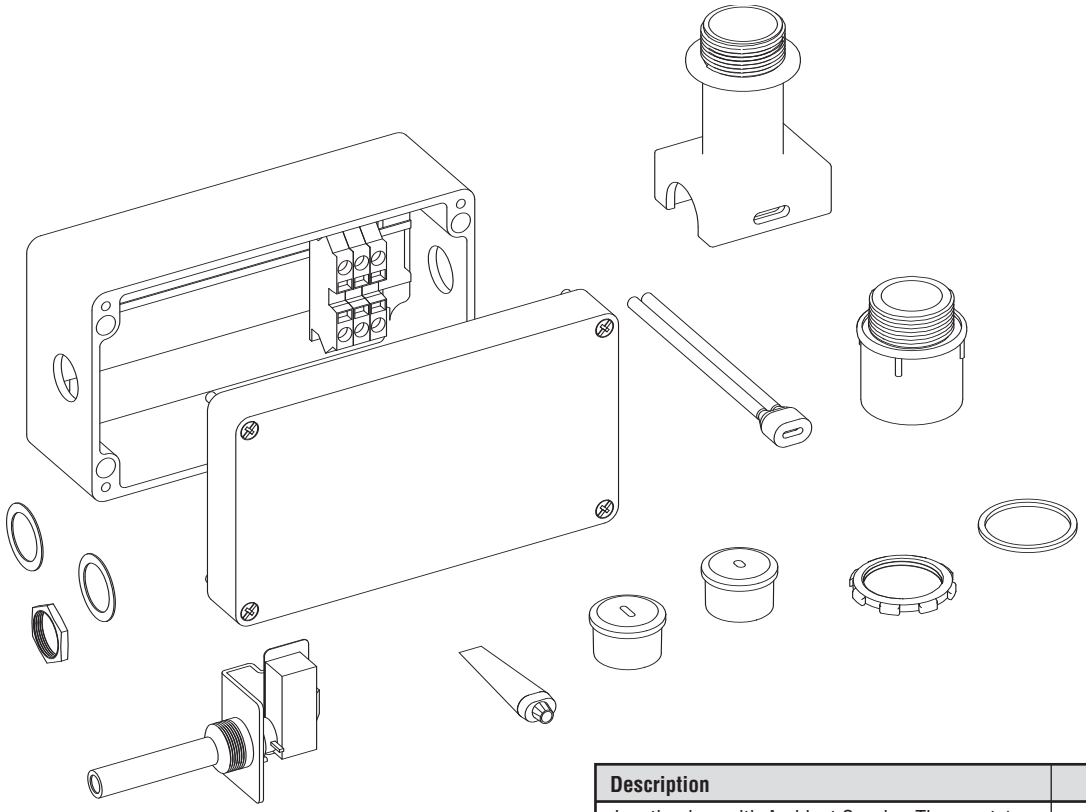
Outer Insulation Diameter (in)	Minimum Aluminum Jacket Thickness, inches (mm)	
	Rigid Insulation	Non-Rigid Insulation
≤ 8	.016 (0.4)	.016 (0.4)
Over 8 thru 11	.016 (0.4)	.020 (0.5)
Over 11 thru 24	.016 (0.4)	.024 (0.6)
Over 24 thru 36	.016 (0.4)	.032 (0.8)
> 36	.024 (0.6)	0.040 (1.0)

Chromalox®

Installation & Operation Instructions

SERVICE REFERENCE	
DIVISION 4	SECTION RT
SALES REFERENCE	PJ943
	168-562581-038
DATE JANUARY, 2010	

UAS Single Entry Power Connection Kit with integral thermostat for Self-Regulating & Constant Wattage Heating Cables



Description	Quantity
Junction box with Ambient Sensing Thermostat	1
Compression fitting	1
Washer for Thermostat	1
Locknut	1
Silicone termination boot	1
Pipe standoff	1
RTV	1
O-Ring	1
Self-regulating cable grommet	1
Constant wattage cable grommet	1

GENERAL

The UAS Single entry power connection kit/ with integral thermostat is used for electrical termination of selfregulating and constant wattage cables. Each kit contains the terminations needed to make all electrical connections.

INSTALLATION

⚠WARNING

Hazard of Electric Shock. Disconnect all power before starting. All installations must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

⚠WARNING

Turn off power before removing junction box cover at all times.

⚠WARNING

Users should install adequate controls and safety devices with their electric heating equipment. Where the consequences of failure may be severe, back-up controls are essential. Although the safety of the installation is responsibility of the user, Chromalox will be glad to assist in making equipment recommendations.

Braid only cable instructions SRL-C, SRF-C, SRM/E-C
CWM-C cable special instructions denoted by *

1. For each cable, push braiding back from the end of the cable. 11 inches from cable end create a bulge. At the bulge, separate the braid to make an opening.

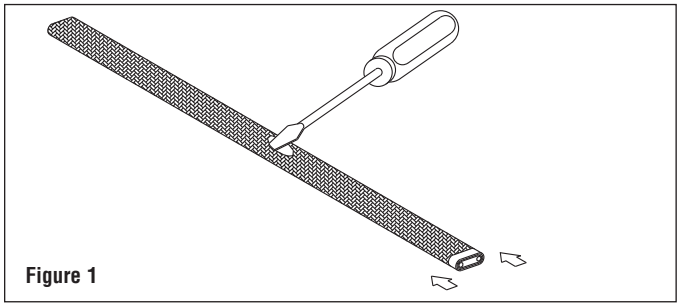


Figure 1

2. While bending the heating cable, work the cable through the braid opening. Pull the braid tight.

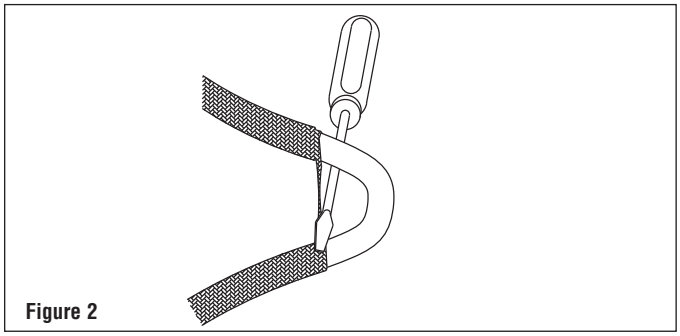


Figure 2

3. Insert cable though pipe standoff and grommet as shown. There should be 8 inches of cable past the grommets edge. Attach the pipe standoff to the pipe with a pipe strap (Chromalox type PS not included) as shown. Leave braid of the cable outside of pipe standoff and connect to ground (grounding clamp not included). Tape cable pipe as shown. For pipes smaller than 1 1/2" diameter a small pipe adapter (Chromalox model SPA not included) is required.

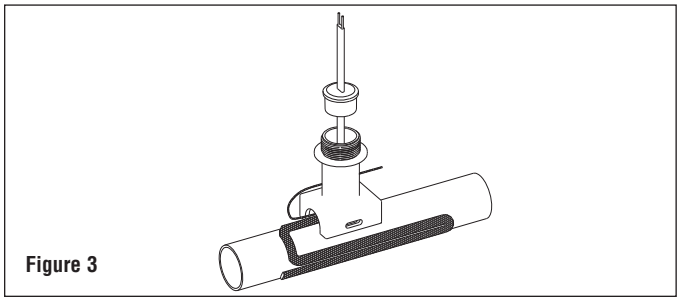


Figure 3

4. Score the inner insulation 7 inches from the end. Lightly cut the inner jacket up the center to end of heating cable and remove the inner jacket from the cable.

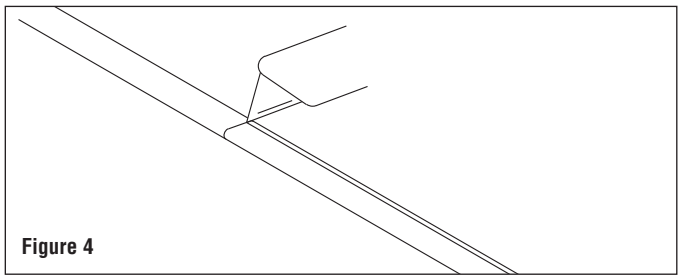


Figure 4

5. Shave the core material from the outside of each bus wire. *Skip this step if using CWM-C constant wattage cable.

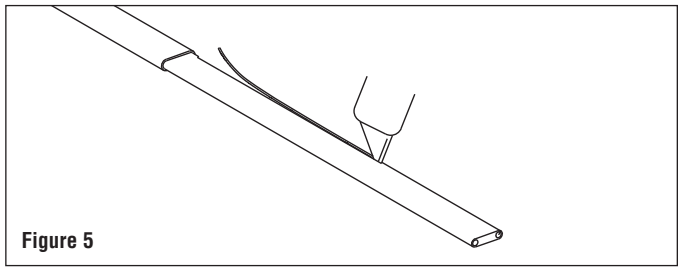


Figure 5

6. Starting at the end of the heating cable, using needle nose pliers or a knife, pull each bus wire away from the core material. *Separate CWM-C leads and strip 1/4" from each leadwire

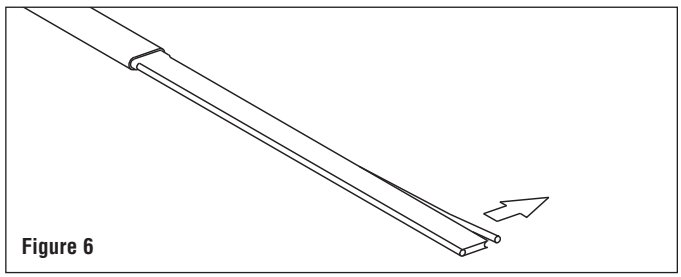


Figure 6

7. Remove the exposed core material and cut 1/4" off the end of each bus wire. *Skip this step if using CWM-C constant wattage cable.

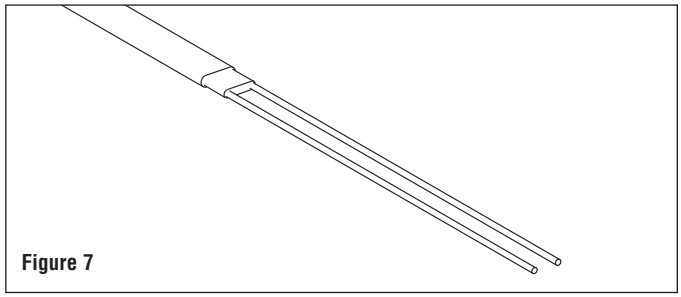


Figure 7

8. Liberally apply RTV over the exposed matrix and leads. Push the rubber boot over the heating cable. Trim lead ends as needed. *Boot is not needed when using CWM-C constant wattage cable.

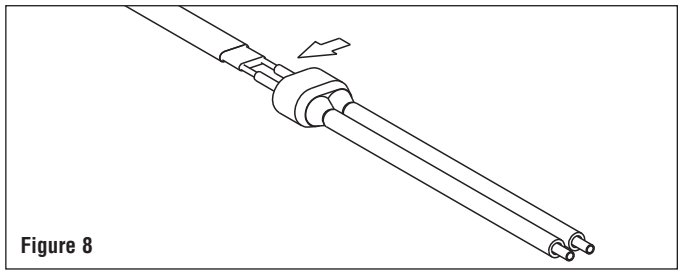


Figure 8

9. Slide compression fitting over cable. Grommet should be placed inside pipe standoff. Termination boot should be spaced 1/2" from sealing grommet. Tighten compression fitting until it bottoms out against pipe standoff.

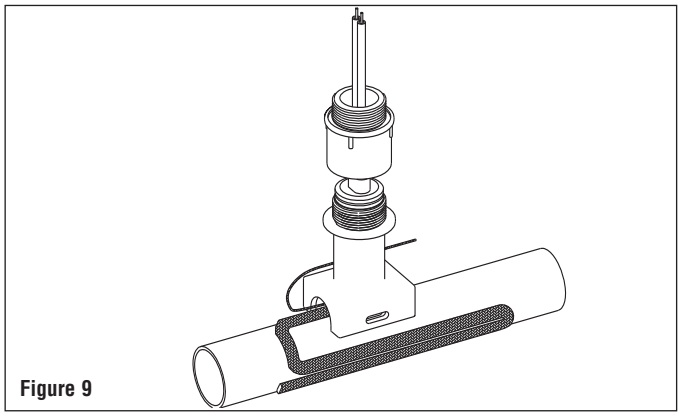


Figure 9

10. Assemble junction box to compression fitting as shown. Tighten locknut until the junction box bottoms out against the lip of the compression fitting. To ensure that box is water tight make sure washer for thermostat is against the enclosure.

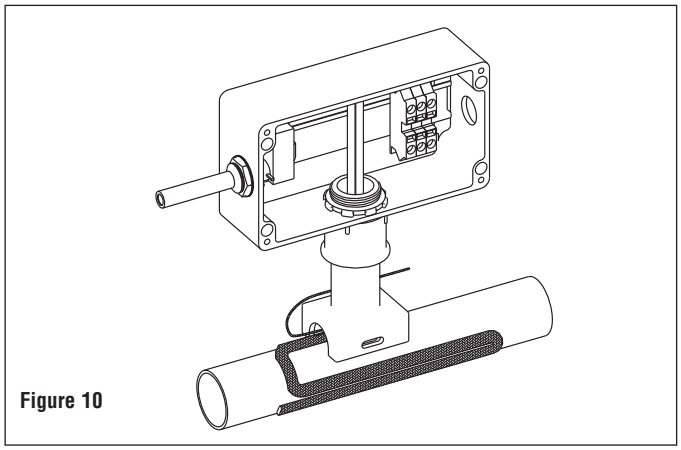


Figure 10

11. Attach 3/4" conduit hub. Use a flat head screwdriver to release the terminal spring clamps and insert cable leads and grounding braid. Please see the electric diagrams below for proper wiring for your application. Attach junction box cover to seal enclosure.

Note: The conduit hub should be approved for Class 1, Div. 2; Class II Div. 1 & 2, Class III, Div. 1 & 2, and NEMA 4X rated by a nationally recognized testing laboratory.

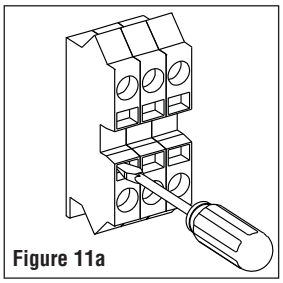


Figure 11a

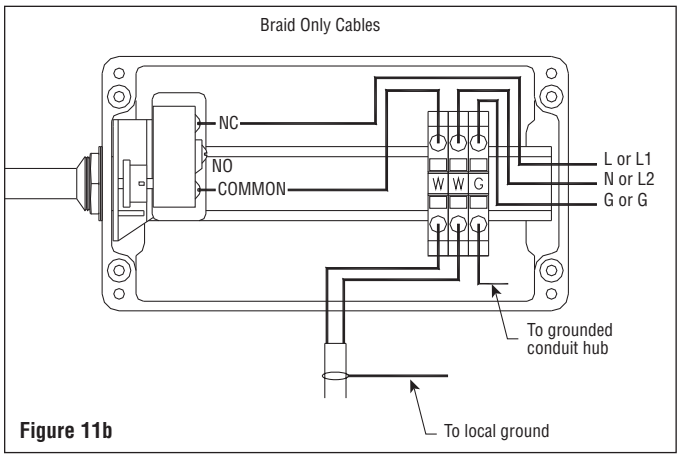


Figure 11b

Overjacketed cable instructions SRL-CR, SRL-CT, SRF-CR, SRM/E-CT CWM-CT cable instructions denoted by *

1. and grommet as shown. 8 inches of cable should extend past the grommet. Attach the pipe standoff to the pipe with a pipe strap (Chromalox type PS not included) as shown. Attach extra cable to pipe as appropriate. For pipes smaller than 1 1/2" diameter optional small pipe adapter (Chromalox model SPA not included) is required.

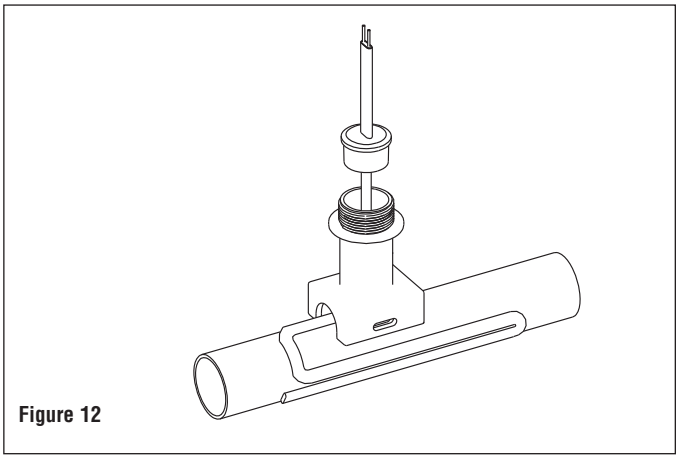


Figure 12

2. Score the outer insulation 7 inches from the end of the cable. Lightly cut the outer jacket up the center to the end of heating cable and remove the outer jacket from the cable. **WARNING**: DO NOT CUT METAL BRAID.

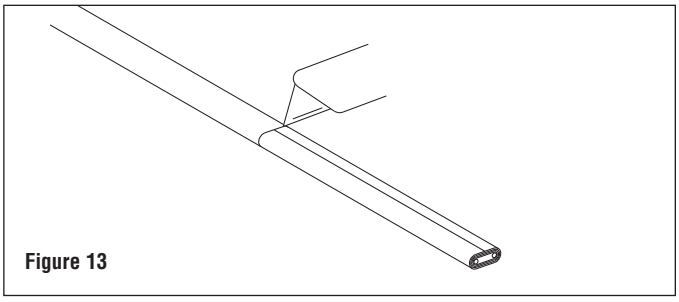


Figure 13

3. Move braid back toward the overjacket, creating a bulge. At the bulge, separate the braid to make an opening.

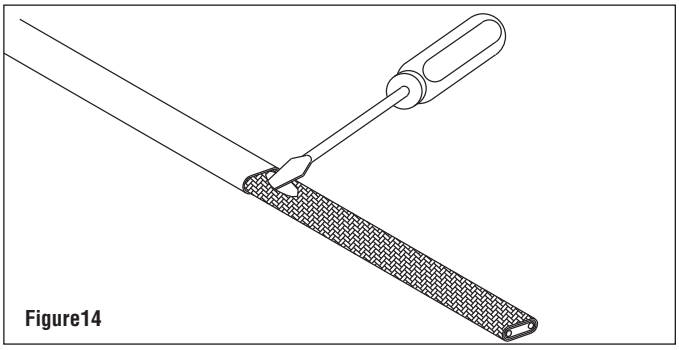


Figure14

4. While bending the heating cable, work the cable through the braid opening. Pull the braid tight.

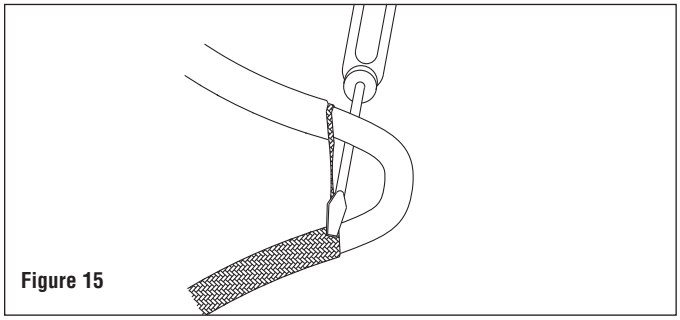


Figure 15

5. Score the inner insulation 6 inches from the end. Lightly cut the inner jacket up the center to end of heating cable and remove the inner jacket from the cable.

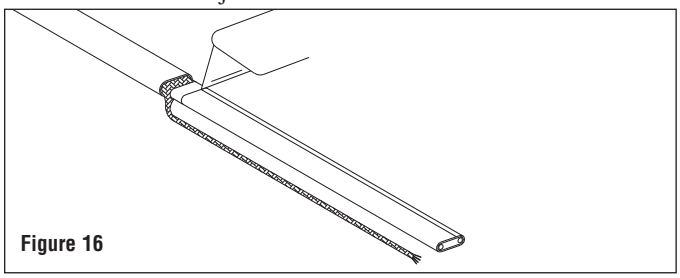


Figure 16

6. Shave the core material from the outside of each bus wire. *Skip this step if using CWM-C constant wattage cable.

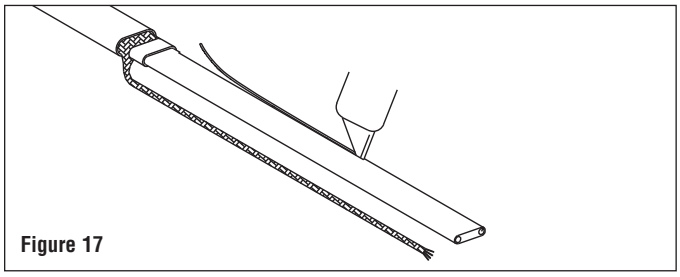


Figure 17

7. Starting at the end of the heating cable, using needle nose pliers or a knife pull each bus wire away from the core material. *Separate CWM-C leads and strip 1/4" from each leadwire.

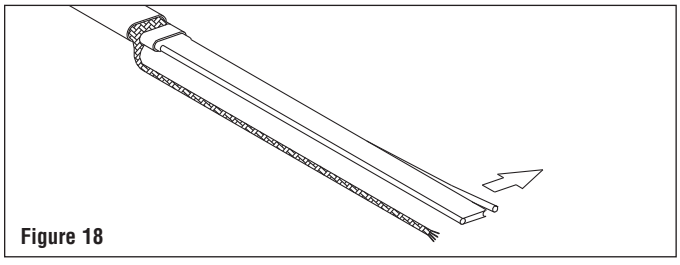


Figure 18

8. Remove the exposed core material and cut 1/4" of the end of each bus wire. *Skip this step if using CWM-C constant wattage cable.

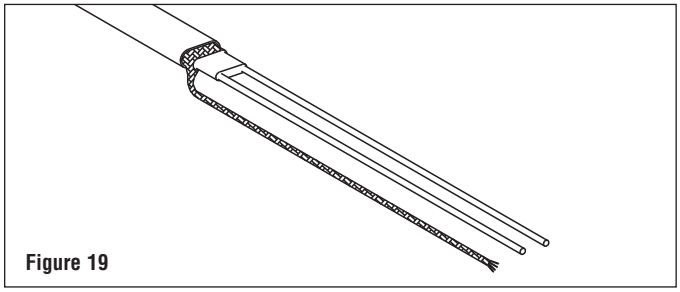


Figure 19

9. Liberally apply RTV over the exposed matrix and leads. Push the rubber boot over the heating cable. Trim lead ends as needed. *Boot is not needed when using CWMC constant wattage cable

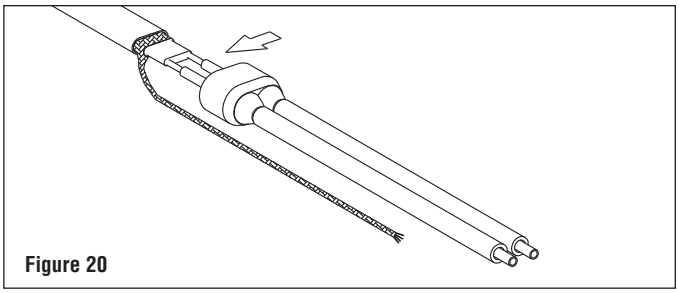


Figure 20

10. Slide compression fitting over cable. Grommet should be placed inside pipe standoff. Termination boot should be spaced 1/2" from sealing grommet. Tighten compression fitting until it bottoms out against pipe standoff.

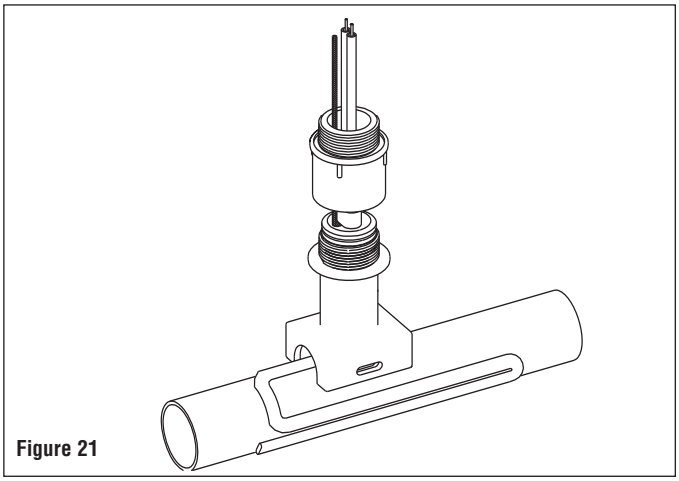


Figure 21

11. Assemble junction box to compression fitting as shown. Tighten locknut until the junction box bottoms out against the lip of the compression fitting. To ensure that box is water tight make sure washer for thermostat is against the enclosure.

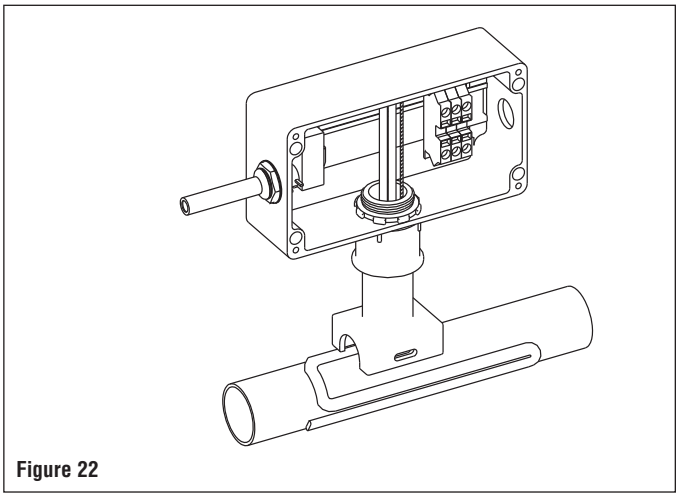


Figure 22

12. Attach 3/4" conduit hub. Use a flat head screwdriver to release the terminal spring clamps and insert cable leads and grounding braid. Please see the electric diagrams below for proper wiring for your application. Attach junction box cover to seal enclosure.

Note: The conduit hub should be approved for Class 1, Div. 2; Class II Div. 1 & 2, Class III, Div. 1 & 2, and NEMA 4X rated by a nationally recognized testing laboratory.

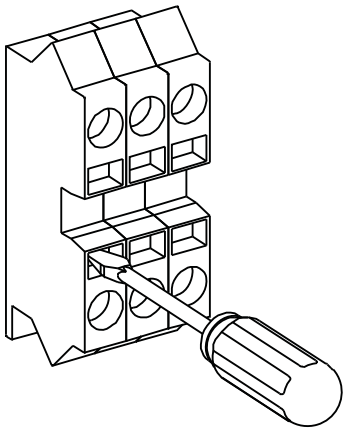


Figure 23a

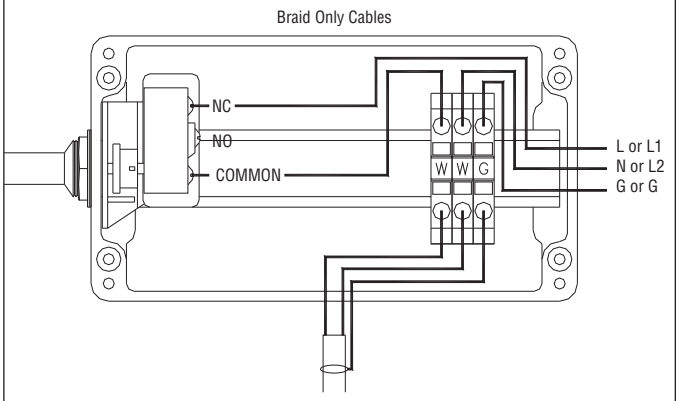


Figure 23b

Limited Warranty:
Please refer to the Chromalox limited warranty applicable to this product at
http://www.chromalox.com/customer-service/policies/termsofsale.aspx.

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 12/08/2017

Installer's Name Douglas Rogers AFT

Sump ID VLCS -1 Choose an item. Choose an item.

Side Slope Information: **Vertical Information:**

Slope __:1

Riser Diameter N/A Inches Sump Diameter 63 Inches

Riser Length N/A Feet Sump Depth 12 Feet

Vertical Depth N/A Feet

Pump & Motor Information:

Mfg unitra Model # UP-2507 S/N T220008751-0790

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 244508 S/N 17F14-29-03362C

Hp 1 Voltage 230 Phase 1 FLA 8.2

Motor Cable # of Conductors 3 Wire Size AWG 12 Length 14

Power Service Supply:

Breaker Size 30 Amp Wire Size AWG 6 Length 800 Ft

Incoming Voltage;

No Load L1-L2 248 L2-L3 X L1-L3 X ~~% Unbalance~~

Full Load L1-L2 248 L2-L3 X L1-L3 X

Full Load Amps L1 9 L2 9 L3 N/A % Unbalanced 0

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Motor Run Amps: L1 7.8 L2 7.9 L3 N/A % Unbalanced .6 %

Xducer/Float Information:

Xducer Mfg N/A Serial # N/A PSI Rating N/A

Float Mfg Conroy Float 1 (NO) – NC Float 2 (NO) – NC Float 3 (NO) - NC
(Circle One) (Circle One) (Circle One)

Control Panel:

MFG SJE Rhombus Model # 112-1-W-1-1-1-L ~~N/A~~ Serial # N/A

Panel Style (Simplex)/Duplex/Lead Lag
(Circle One)

Set Points:

Pump On N/A Pump Off N/A POC N/A

Low Level N/A Sensor Fail N/A Xducer N/A

VFD Set Hz N/A Motor Starter Overload Setting N/A

Float 1 12 Inches Float 2 24 Inches Float 3 48 Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3}$ = 50 amps

50 - 46 = 4 amps

$\frac{4}{50}$ = 0.08 or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 12/08/2017

Installer's Name Douglas Rogers

Sump ID VLGS-2 Choose an item. Choose an item.

Side Slope Information: **Vertical Information:**

Slope __:1

Riser Diameter N/A Inches Sump Diameter 63 Inches

Riser Length N/A Feet Sump Depth 12 Feet

Vertical Depth N/A Feet

Pump & Motor Information:

Mfg Ultra Model # UP2507 S/N T2200008751-0790

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 244506 S/N 17E14-29-03362C

Hp 1 Voltage 230 Phase 1 FLA 8.2

Motor Cable # of Conductors 3 Wire Size AWG 12 Length 14

Power Service Supply:

Breaker Size 30 Amp Wire Size AWG #6 Length 325

Incoming Voltage;

No Load L1-L2 248 L2-L3 X L1-L3 X ~~% Unbalance~~

Full Load L1-L2 248 L2-L3 X L1-L3 X

Full Load Amps L1 8.8 L2 8.8 L3 X % Unbalanced 0

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Motor Run Amps: L1 7.8 L2 7.8 L3 N/A % Unbalanced 0

Xducer/Float Information:

Xducer Mfg N/A Serial # N/A PSI Rating N/A

Float Mfg Conory Float 1 (NO) – NC Float 2 (NO) – NC Float 3 (NO) - NC
(Circle One) (Circle One) (Circle One)

Control Panel:

MFG STE Rhanbus Model # 112-1-W-1-1-1-2 Serial # _____

Panel Style (Simplex)/Duplex/Lead Lag
(Circle One)

Set Points:

Pump On N/A Pump Off N/A POC N/A

Low Level N/A Sensor Fail N/A Xducer N/A

VFD Set Hz N/A Motor Starter Overload Setting N/A

Float 1 12 Inches Float 2 24 Inches Float 3 48 Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 12/8/2017

Installer's Name Douglas Rogers

Sump ID LCS-1 Choose an item. Choose an item.

Side Slope Information:

Slope 3 :1

Riser Diameter 18" Inches

Riser Length 44 Feet

Vertical Depth 14.6 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg UNItra Model # ~~T2200011794-~~ up 2507 S/N T2200011794-0732

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 17E14-30 S/N 17E14-30-022370

Hp 1 Voltage 230 Phase 3 FLA _____

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 45 Ft

Power Service Supply:

Breaker Size 20 Amp Wire Size AWG #8 Length 150

Incoming Voltage;

No Load L1-L2 248 L2-L3 x L1-L3 x % Unbalance Ø

Full Load L1-L2 248 L2-L3 ✓ L1-L3 x

Full Load Amps L1 6.4 L2 6.4 L3 X % Unbalanced Ø

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Motor Run Amps: L1 3.5 L2 3.6 L3 3.6 % Unbalanced 1%

Xducer/Float Information:

Xducer Mfg keller Serial # 160856 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-01A Serial # AFT-1A-201711-001

Panel Style (Simplex)/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 12 Pump Off 24 POC 36

Low Level 6 Sensor Fail 276 Xducer 2

VFD Set Hz 50 Motor Starter Overload Setting _____

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 12/20/2017

Installer's Name Douglas Rogers AFT

Sump ID LCS-2 Choose an item. Choose an item.

Side Slope Information:

Slope 3 :1

Riser Diameter 18" Inches

Riser Length 87 Feet

Vertical Depth 29 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Unitra Model # UP-2507 S/N T22000117 94-0733

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 234534 S/N 17E14-30-02236C

Hp 1 Voltage 230 Phase 3 FLA 3.9

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 90 Ft

Power Service Supply:

Breaker Size _____ Wire Size AWG _____ Length _____

Incoming Voltage;

No Load L1-L2 247 L2-L3 N/A L1-L3 N/A ~~% Unbalance~~ _____

Full Load L1-L2 247 L2-L3 N/A L1-L3 N/A

Full Load Amps L1 6.4 L2 6.3 L3 N/A ~~% Unbalanced~~ .7%

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Motor Run Amps: L1 3.6 L2 3.5 L3 3.5 % Unbalanced .1%

Xducer/Float Information:

Xducer Mfg Keller Serial # 160862 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-20171-002

Panel Style (Simplex)/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 24 Pump Off 12 POC 36

Low Level 6 Sensor Fail 276 Xducer 2

VFD Set Hz 54 Motor Starter Overload Setting N/A

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 12/20/2017

Installer's Name Douglas Rogers AFT

Sump ID LCS-3 Choose an item. Choose an item.

Side Slope Information:

Slope 1 :1

Riser Diameter 48 Inches

Riser Length 20 Feet

Vertical Depth 12 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Unitra Model # UP-25-07 S/N T22000117 94-0731

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 234543 S/N 17E14-30-02257C

Hp 1 Voltage 230 Phase 3 FLA 3.9

Motor Cable # of Conductors 3 Wire Size AWG 12 Length 24 ~~50~~ FT

Power Service Supply:

Breaker Size 20 Wire Size AWG #10 Length 50

Incoming Voltage;

No Load L1-L2 249 L2-L3 X L1-L3 X ~~% Unbalance~~ _____

Full Load L1-L2 249 L2-L3 X L1-L3 X

Full Load Amps L1 6.5 L2 6.5 L3 X % Unbalanced 0

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Motor Run Amps: L1 3.5 L2 3.5 L3 3.5 % Unbalanced 0

Xducer/Float Information:

Xducer Mfg Keller Serial # 160860 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-201711-003

Panel Style (Simplex)/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 24 Pump Off 17 POC 36

Low Level 6 Sensor Fail 276 Xducer 2

VFD Set Hz 55 Motor Starter Overload Setting N/A

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 1/23/2018

Installer's Name Douglas Rogers AFT

Sump ID LCS-4 Choose an item. Choose an item.

Side Slope Information:

Slope 3 :1

Riser Diameter 18" Inches

Riser Length 35 Feet

Vertical Depth 11.6 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Unitra Model # up-2507 S/N T3200007115-1561

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 234543 S/N 17E14-31-62490C

Hp 1 Voltage 230 Phase 3 FLA 3.9

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 40

Power Service Supply:

Breaker Size 40 Wire Size AWG #6 Length 212

Incoming Voltage;

No Load L1-L2 248 L2-L3 x L1-L3 x % ~~Unbalance~~ _____

Full Load L1-L2 248 L2-L3 x L1-L3 x

Full Load Amps L1 6.6 L2 6.6 L3 x % Unbalanced 0

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Fax: 501-835-3251
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Motor Run Amps: L1 3.6 L2 3.6 L3 3.6 % Unbalanced 0

Xducer/Float Information:

Xducer Mfg Keller Serial # 160824 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-201711-004

Panel Style Simplex/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 24 Pump Off 12 POC 36

Low Level 6 Sensor Fail 278 Xducer 2

VFD Set Hz 55 Motor Starter Overload Setting N/A

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 1/23/2018

Installer's Name Douglas Rogers AFT

Sump ID LCS-5 Choose an item. Choose an item.

Side Slope Information:

Slope 3 :1

Riser Diameter 18 Inches

Riser Length 60 Feet

Vertical Depth 20 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Unitra Model # up-2507 S/N T2200007115-1581

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 234543 S/N 17E14-31-0248/C

Hp 1 Voltage 230 Phase 3 FLA 3,9

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 65

Power Service Supply:

Breaker Size 40 Wire Size AWG 6 Length 545

Incoming Voltage;

No Load L1-L2 248 L2-L3 X L1-L3 X ~~% Unbalance~~ _____

Full Load L1-L2 248 L2-L3 X L1-L3 X

Full Load Amps L1 6.8 L2 6.8 L3 X % Unbalanced 0

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Motor Run Amps: L1 3.5 L2 3.5 L3 3.5 % Unbalanced 0

Xducer/Float Information:

Xducer Mfg Keller Serial # 160843 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-201711-005

Panel Style Simplex/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 24 Pump Off 12 POC 36

Low Level 6 Sensor Fail 278 Xducer 2

VFD Set Hz 56 Motor Starter Overload Setting N/A

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 1/23/2018

Installer's Name Douglas Rogers

Sump ID LCS-6 Choose an item. Choose an item.

Side Slope Information:

Slope 3 :1

Riser Diameter 18 Inches

Riser Length 50 Feet

Vertical Depth 16.8 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Unifra Model # UP-2507 S/N T2200007115-1573

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 234543 S/N 17E14-30-02235C

Hp 1 Voltage 230 Phase 3 FLA 3.9

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 55

Power Service Supply:

Breaker Size 50 Wire Size AWG 6 Length 736

Incoming Voltage;

No Load L1-L2 248 L2-L3 X L1-L3 X ~~% Unbalance~~ _____

Full Load L1-L2 248 L2-L3 X L1-L3 X

Full Load Amps L1 6.7 L2 6.7 L3 X % Unbalanced 0

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Fax: 501-835-3251
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Motor Run Amps: L1 3.6 L2 3.6 L3 3.6 % Unbalanced 0

Xducer/Float Information:

Xducer Mfg Keller Serial # 160857 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-20171-006

Panel Style Simplex/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 24 Pump Off 12 POC 36

Low Level 6 Sensor Fail 278 Xducer 2

VFD Set Hz 55 Motor Starter Overload Setting N/A

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 1/23/2018

Installer's Name Douglas Rogers AFT

Sump ID LGS-7 Choose an item. Choose an item.

Side Slope Information:

Slope 3 :1

Riser Diameter 18 Inches

Riser Length 50 Feet

Vertical Depth 16.6 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Ultra Model # UP-2507 S/N T7200007115-1571

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 234543 S/N 17E14-30-02244C

Hp 1 Voltage 230 Phase 3 FLA 3.9

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 55

Power Service Supply:

Breaker Size 50 Wire Size AWG 6 Length 539

Incoming Voltage;

No Load L1-L2 248 L2-L3 X L1-L3 X % Unbalance _____

Full Load L1-L2 248 L2-L3 X L1-L3 X

Full Load Amps L1 6.7 L2 6.7 L3 X % Unbalanced 0

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Phone: 501-835-3200
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Motor Run Amps: L1 3.5 L2 3.5 L3 3.5 % Unbalanced 0

Xducer/Float Information:

Xducer Mfg keller Serial # 160932 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-201711-007

Panel Style Simplex/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 24 Pump Off 12 POC 36

Low Level 6 Sensor Fail 278 Xducer 2

VFD Set Hz 55 Motor Starter Overload Setting N/A

Float 1 NA Inches Float 2 NA Inches Float 3 NA Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

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Installation Record at Startup

Project Job Number 9301601R Startup Date: 1/22/2018

Installer's Name Douglas Rogers AFT

Sump ID LCS-8 Choose an item. Choose an item.

Side Slope Information:

Slope 3 :1

Riser Diameter 18" Inches

Riser Length 60 Feet

Vertical Depth 20 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Unitra Model # UP 2507 S/N T220000 7115-1590

GPM 25 @ 210 Ft. TDH

Motor Mfg Franklin Model 234543 S/N 17E14-28-02430C

Hp 1 Voltage 230 Phase 3 FLA 3.9

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 65

Power Service Supply:

Breaker Size 50 Wire Size AWG 6 Length 151

Incoming Voltage;

No Load L1-L2 248 L2-L3 X L1-L3 X % Unbalance _____

Full Load L1-L2 248 L2-L3 X L1-L3 X

Full Load Amps L1 6.7 L2 6.7 L3 _____ % Unbalanced _____

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Motor Run Amps: L1 3.6 L2 3.6 L3 3.6 % Unbalanced 0

Xducer/Float Information:

Xducer Mfg Keller Serial # 161012 PSI Rating 16

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-20171-008

Panel Style (Simplex/Duplex/Lead Lag) (Circle One)

Set Points:

Pump On 24 Pump Off 12 POC 36

Low Level 6 Sensor Fail 278 Xducer 2

VFD Set Hz 55 Motor Starter Overload Setting N/A

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

How to figure 3 Phase Unbalance % (Same For Volts)

EXAMPLE:

T1 = 51 amps
T2 = 46 amps
+ T3 = 53 amps
Total = 150 amps

$\frac{150}{3} = 50$ amps

50 - 46 = 4 amps

$\frac{4}{50} = 0.08$ or 8%

7801 Warden Road, Sherwood AR 72120
Phone: 501-835-3200
Fax: 501-835-3251
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Installation Record at Startup

Project Job Number 9301601R Startup Date: 1/22/2018

Installer's Name Douglas Rogers AFT

Sump ID LCS 9 Choose an item. Choose an item.

Side Slope Information:

Slope 3:1

Riser Diameter 18" Inches

Riser Length 40 Feet

Vertical Depth 13.3 Feet

Vertical Information:

Sump Diameter _____ Inches

Sump Depth _____ Feet

Pump & Motor Information:

Mfg Unitra Model # up 2509 S/N T2200008751-0788

GPM 25 @ 275 Ft. TDH

Motor Mfg Franklin Model 234514 S/N 1161 4-28-02213C

Hp 1.5 Voltage 230 Phase 3 FLA 5

Motor Cable # of Conductors 4 Wire Size AWG 12 Length 45

Power Service Supply:

Breaker Size 20 Wire Size AWG #10 Length 35

Incoming Voltage;

No Load L1-L2 248 L2-L3 X L1-L3 X % Unbalance _____

Full Load L1-L2 248 L2-L3 X L1-L3 X

Full Load Amps L1 8.7 L2 8.7 L3 X % Unbalanced 0

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4.6

Motor Run Amps: L1 4.6 L2 4.6 L3 4.6 % Unbalanced 0

Xducer/Float Information:

Xducer Mfg Keller Serial # 160 845 PSI Rating 10

Float Mfg N/A Float 1 NO – NC (Circle One) Float 2 NO – NC (Circle One) Float 3 NO - NC (Circle One)

Control Panel:

MFG AFT Model # WM-1A Serial # AFT-1A-201711-009

Panel Style Simplex/Duplex/Lead Lag (Circle One)

Set Points:

Pump On 24 Pump Off 12 POC 36

Low Level 6 Sensor Fail 276 Xducer 2

VFD Set Hz 55 Motor Starter Overload Setting N/A

Float 1 N/A Inches Float 2 N/A Inches Float 3 N/A Inches

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CONSOLIDATED LAND SERVICES
INCORPORATED

ENGINEERING
SURVEYING
MATERIALS TESTING
(501) 425-6161

2113 HIGHWAY 62 EAST
SUITE B
MOUNTAIN HOME, AR 72653
FAX (501) 424-3884

AIR TEST - SEWER

Project NABORS Landfills No. _____

Date of Test _____ Line No. _____

	Sta.		to Sta.	Pipe Diameter		Initial psig		Final psig	Elapsed Time
South F.M.	LCS9 0+00	to	CAV 1 6+00	2"x4"	Dual Contained	9-27-17	100psi	99psi	Start 2:40 P.M. - End 3:40 P.M.
South F.M.	CAV 1 6+00	to	CAV 2 10+00	2" x4"	Dual Contained	10-11-17	105psi	105psi	Start 11:27 A.M. - End 12:27 P.M.
South F.M.	CAV 2 10+00	to	CAV 3 14+80	2"x4"	Dual Contained	10-12-17	100psi	96psi	Start 9:36 A.M. - End 11:53 A.M
North F.M.	VLCS 1 0+00	to	VLCS 2 6+60	2x4"	Dual Contained	10-13-17	110psi	106psi	Start 12:42 P.M. - End 1:50 P.M.
North F.M.	VLCS 2 6+60	to	CAV 10 8+85	2x4"	Dual Contained	10-26-17	101psi	99psi	Start 8:25 A.M. - End 9:30 A.M.
North F.M.	VLCS 1 0+00	to	Tank Farm ~13+54	2"x4"	Dual Contained	11-14-17	99psi	99psi	Start 11:21 A.M. - End 12:21 P.M.
West F.M.	LCS 2 0+00	to	Tank Farm ~18+60	2"x4"	Dual Contained	12-13-17	96psi	95psi	Start 11:05 A.M. - End 12:05 P.M.
South F.M.	LCS9 0+00	to	Tank Farm ~	2"x4"	Dual Contained	12-20-17	100psi	100psi	Start 10:22 A.M. - End 11:22 A.M

Except the Following Segments:

_____

_____

The above line meets or exceeds air exfiltration standards as required in the approved specifications for this job.

_____ _____

Contractor's Representative City's Representative

_____

City