ITVC Series Intelligent Total Valve Controller

Annex C: HPU control module (HPU: Hydraulic Power Unit)





Electro-Hydraulic actuator with ITVC-HPU

Document Number	Prepared	Approved	Date	Release
IOM-ITVC-HPU	AA	GR	24/02/2016	00



DVG ITVC Series – "Intelligent Total Valve Controller" ANNEX C: HPU CONTROL MODULE

1	I	Introduction4		
2	E	Electrical power supply5		
3	F	Features5		
	3.1	I I/O's to control the HPU	ó	
	3.2	2 Electrical protections	7	
	3.3	B Electrical motors and pumps	7	
	3.4	4 Pump control	3	
	3.5	5 Optional analogue 4-20 mA transmitters)	
	3.6	o Optional digital sensors)	
	3.7	7 Remote signalling)	
	3.8	3 Local signalling)	
4	ŀ	HPU options in the ITVC HMI10)	
	4.1	I MENU chart10)	
	4.2	2 SETUP chart1	1	
	4	4.2.1 Power HPU options12	2	
5	ľ	ITVC-HPU Troubleshooting1	7	
6	I	Installation1	9	
	6.1	I Safety recommendation19)	
	6.2	2 ITVC-HPU Weight and Measurements19)	
	6.3	Cables and terminal blocks)	
7	Maintenance and Cleaning20			
8	Decommissioning			
9	Ν	Nameplates		
1() I	ITVC-HPU start-up2	1	
WARRANTY				
Т	Trade Marks:			

DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dygautomation.it www.dygautomation.it SHEET 3 DI 22



1 Introduction



This document, **ITVC Annex C: "HPU control module"**, contains the information to set and use the **HPU** (Hydraulic Power Unit) **control module** of the **ITVC I**ntelligent Total valve Controller. It is supplied to the user together with the manual **IOM-ITVC-Basic** if the actuator is fitted out with self-contained HPU.

The ITVC Annex C: "HPU control module" should be considered an integral part of the document IOM-ITVC-Basic for actuator with self-contained HPU.

Refer to document "IOM-ITVC-Basic" for the complete Installation, Operation and Maintenance instructions of the ITVC

ITVC Annex C: "HPU control module" and "IOM-ITVC-Basic" are integral parts of the apparatus and must be carefully read, understood and consulted before use and must be retained for future reference

WARNING!

Do not install, operate, or maintain an ITVC without first being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance, and carefully reading and understanding the contents of this manual, including all safety cautions and warnings. For any questions regarding these instructions, contact the factory before proceeding.

The **HPU control module** consists in a hardware including additional I/O's, electrical power supply stage, contactors, terminal block and and digital link with the ITVC standard module. It works under control of the SW program of standard ITVC. The enclosure has the same protection degree of the standard ITVC. The two modules, **standard ITVC** and **HPU control**, are mechanically and electrically connected and work as **one only unit**.

The **ITVC** with **HPU control module**, called "**ITVC-HPU**", has the complete set of features of standard ITVC and in addition it controls the HPU. Depending on the configuration done, the **HOME** page of ITVC HMI can be "**type HPU**" or "**standard type**". (See IOM-ITVC-Basic HOME page paragraph). In the "type HPU" are shown the main data of the HPU and in the "standard type" is visible the actuator position. The user can switch from one page to the other one as follows: by \Rightarrow and \Rightarrow select the icon f or M and then press \checkmark , see "Menu chart" paragraph.

The below figure shows an example of **HOME** page, **HPU type**. The **HOME** page, **Standard type**, can be viewed by the procedure described above. The situation is reversed if the configured **HOME** page is **standard type**. Refer to **IOM-ITVC-Basic**, ITVC HMI chapter, to view the HOME page types. Refer to that IOM to find the instructions relevant to **navigation** in the **MENU**, **MENU charts**, **Actuator control mode**, **Alarm/Warning visualization**, **actuator parameter settings**, **data collected**, **troubleshooting**, **installation**, **start-up**, **etc**. The present IOM reports only the instructions relevant to configuration and use of HPU control module.



The figures present in this IOM consider **HOME** page **type HPU**. See Annex A, B, D to find the instruction of the optional functions Line Break, PST and HIPPS.





The figure below shows the ITVC-HPU, ITVC with HPU control module.



The HPU control module contains: contactors to drive the electrical motors, on-off switch, power supply module, output relays, HPU terminal block, digital and analogue inputs available for the HPU sensors and digital outputs for optional Solenoid Operated Valves.

2 Electrical power supply

One only electrical power is requested to supply both ITVC and HPU control modules. The following options are available:

- AC 3-PH: 230, 400, 440 Vac, 50Hz, +10%, -10%
- AC 1-PH: 230 Vac, 50Hz, +10%, -10%
- DC: 24Vdc, +15%, -20%

On request, separated electrical power for ITVC and HPU control module can be provided.

On request, the ITVC can be equipped with rechargeable lithium battery which keeps the ITVC working in monitoring mode in case of main electrical power supply failure. See Annex B for the instructions of Battery option. Even if HPU Control Module is equipped with on-board main power switch it is recommended to use a separated main

switch to isolate the electrical power

3 Features

In addition to the features of standard ITVC, the **ITVC-HPU** includes the capability to control a **HPU** (Hydraulic **P**ower Unit). Basically a **HPU** is an electro-hydraulic equipment that converts electrical power to hydraulic power by means of an electrical motor and hydraulic pump. In its turn, the hydraulic power is used to move actuators and valves by means of Solenoid Operated Valves (SOV's). In addition to motor and pump, a HPU is equipped with hydraulic components, as check valves, ball valves, filters, hand-pump, gauges, oil tank, accumulator, etc., hydraulically interconnected and electric sensors (pressure, level, current, etc.). An electronic controller (ITVC-HPU) reads the sensors and activates the motor to maintain the hydraulic pressure within the required limits and generates alarm in case of malfunction

With reference to the HPU control, the ITVC-HPU features include the following functions:

- Acquisition of digital and analogue sensors of HPU
- Control of 1 or 2 electrical motors according to type of HPU
- Pump control based on analogue oil pressure measurement
- Control of oil level, temperature, turbidity, etc. (if the HPU is equipped with analogue or digital sensors)
- Measure of motor current and voltage power supply
- Optional calculation of residual stroke available by the Accumulator
- Local and remote signaling of status and failures







The figure below shows the block diagram of the complete system.

Configuration and visualization of variables is done by the ITVC-HMI, according to instructions in the IOM-ITVC-Basic and Annex A, B, D

3.1 I/O's to control the HPU

The **HPU control module** has the following I/O's:

- 3 x 4-20 mA analogue inputs: optocoupled isolated amplifier, factory configuration. Depending on the HPU sensors, the following options can be set:
 - Oil pressure
 - Oil level

- Oil cleanness
- Oil temperature
- **4 digital inputs:** optocoupled, factory configuration. Depending on the HPU sensors, the following options can be set:
 - o Oil piston end travel switch
 - o Oil volume loss -5% switch
 - Oil volume loss -10% switch
 - o Oil piston posit switch low-low
 - Oil level switch

Motor 2 running

0

- Oil temperature switch
- Door switch
- Hand pump selector
- Pneumatic switch
- PST mechanical switch
- 2 contactors: each on-board contactor supplies one electrical AC 3-PH or 1-PH motor of pumps. In case of DC power supply and DC motor one only contactor is on board of the HPU control module, the contactor to drive the second motor is in additional enclosure
- 2 out relays: available for remote signalling of HPU status, single side stable, voltage free, SPDT contacts, from 24Vdc-ac to 230Vac / 5A. Condition to switch of each relay configurable by ITVC HMI.
 - Motor 1 running

- Motor 1&2 runningHeater on/off.
- **3 additional coil drivers:** 24Vdc, fuse protection, to drive coils of SOV's, test to check coil integrity, available for special applications
- Main power: terminals for connection to electrical power

The above I/O's are available on the terminal board of the HPU control module.



The **ITVC basic module** has the following inputs. If they are not used to control the actuator, are available to control the HPU (see IOM-ITVC-Basic).

- **Digital inputs:** the ITVC basic module has 4 digital inputs on the actuator terminal block. Depending on the type of actuator and HPU they can be set to read the status of HPU sensors. Below is the complete list of available options. In grey are the options reserved to HPU control.
 - o Open Limit switch
 - o Close Limit switch
 - o PST travel switch
 - o Oil level switch
 - o S3 min pressure switch
 - o S3 max pressure switch
 - o Fault inverter switch

- o HPU magneto thermal switch
- o Contactor 1 failure switch
- o Contactor 2 failure switch
- o PSLL switch
- o PSHH switch
- o Mechanical PST switch

Valve position

24V sens

Position Demand

Cylinder pressure S4

0

0

0

0

- **4-20 mA analogue inputs:** the ITVC basic module has 4 x 4-20 mA analogue inputs on the actuator terminal block (See IOM ITVC-Basic). Depending on the type of actuator and HPU they can be set to read an HPU transmitter. Below is the complete list of available options. In grey is the option for the HPU
 - o Line pressure L1
 - Line pressure L2
 - o Line pressure S3
 - o Oil level
 - o ITVC temperature

The "Oil level" and "Oil level switch" options are available also in the I/O's of HPU control module. The electrical scheme shows the I/O's used for the HPU and for the actuator.

3.2 Electrical protections

- Main power switch: to switch on/off the electrical power of the system HPU-ITVC
- Voltage sensor: to measure the main voltage supply. The value can be viewed by the HMI of the ITVC. If the voltage is out of the configured limits an alarm is generated
- **Phase loss sensor:** available only in the 3-PH version. In case of phase loss an alarm is generated and the electrical motors of pumps are blocked
- **Current sensors:** to measure the absorbed current. The value can be viewed by the HMI of the ITVC. If the current is out of the configured limits an alarm is generated and the pumps are blocked
- **Current unbalance:** available only if the main power supply is 3-PH. If the difference between the current of phases is greater than a configurable value an alarm is generated and pump are blocked
- **High temperature of electronics**: the HPU control module and the ITVC are equipped with temperature sensors. If the temperature is out of configured "working temperature" limits, the pumps are blocked and an alarm is set.

3.3 Electrical motors and pumps

According to type of HPU, the ITVC with HPU control module can drives one or two AC electrical motors. Both contactors are inside the HPU control module enclosure. If the power supply is DC, one only contactor is inside the above enclosure. The second one should be placed inside an additional enclosure. In case of two pumps and depending on the request, the pumps can work in parallel or one at a time with automatic exchange.



3.4 Pump control

Oil pressure is measured by a 4-20 mA analogue pressure transmitter. Oil pressure is visible in the HOME page of the ITVC HMI. When it is lower than "Minimum pressure", configured in the "Working pressure HPU" menu, the electrical motor starts. It stops when the pressure reaches "Maximum pressure", configured in the same menu, (see SETUP, Administrator menu, Power HPU). The HPU may have one or two pumps. Setting is done in the "Power HPU, Engine power HPU" menu.

a) Case with 2 electrical motors

One pump at a time works. Cyclically, at the end of the configured time, the two pumps are exchanged. By the HMI procedure "Exchange engines", it is possible to set the working time of each pump and the first pump that should start (1 or 2). Pumps are exchanged also in case of alarm.

b) Case with 1 electrical motor

One only pump is available and works according to the above description.

Diagnostic and Alarms:

By the analogue pressure measure the following checks are done:

- if pressure exceeds the configured limit (see Power HPU, Alarm pressure menu) an alarm is generated and both pumps are blocked
- if pressure fall down the configured limit (see Power HPU, Alarm pressure HPU menu) an alarm is generated. • If pump is on and pressure still decreases the pump is blocked
- if one pump runs, and if "pressure increase / minute" is lower than the configured limit an alarm is generated (limit = 0.2 bar/configured "Max recharge time" time, see Power HPU, Max recharge time menu)

The following optional sensors can be installed in the HPU to check correct operation and generates alarms in case of malfunction:

- **Level switch**, to detect low oil level in the tank:
 - If it trips an alarm is generated and both pumps are blocked 0
- Motor thermostats, to detect high motor temperature:
- If it trips an alarm is generated and the hot motor is blocked 0
- **Oil temperature thermostat**, to detect high oil temperature: If it trips an alarm is generated and both pumps are blocked 0

The figure below shows the **HOME** page, HPU type, in case of HPU control by **analogue pressure transmitter**. If the hydraulic actuator connected to the HPU, is equipped with analogue position transmitter, the icon 🖌 allows viewing the actuator position, see MENU chart. By selecting the icon M the HOME page can be restored, see "MENU chart" and "Actuator position visualization" paragraphs.

Vice-versa if the HOME page is "standard type", the icon $|\mathbf{M}|$ allows viewing the HPU data page. By the icon $|\mathbf{M}|$ the **HOME** page is restored



DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti nº 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it



ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED

SHEET 8 DI 22



3.5 Optional analogue 4-20 mA transmitters

Oil level transmitter: the HPU should be equipped with 4-20mA transmitter to measure the oil level in the reservoir. Oil level is shown in the **HOME** page and in the **Measurement** menu. The minimum oil level can be set in the "Power HPU menu"

Oil temperature transmitter: the HPU should be equipped with 4-20mA transmitter to measure the oil temperature in the reservoir. Oil temperature is visible in the **Measurement** menu. The option "Working oil temperature" in the "Power HPU menu" allows setting the minimum and maximum temperature. If the measured temperature exceeds the "high temperature" limit, an alarm is generated and pumps are blocked. In case of "low temperature" limit an alarm is generated and the heater is activated (if present)

Oil cleanness transmitter: the HPU should be equipped with 4-20mA transmitter to measure the oil turbidity in the reservoir. Oil turbidity is visible in the **Measurement** menu. The option "Oil turbidity" in the "Power HPU menu" allows setting the turbidity limits to generate a warning and an alarm signal. In case of alarm the pumps are blocked.

Estimation of residual stroke by accumulator: if oil level measurement is done by an **analogue transmitter** and pump control is **by analogue pressure transmitter**, an algorithm can calculate the number of residual strokes with the remaining pressurized oil in the accumulator. The estimated value is visible by the menu options of ITVC HMI.

3.6 Optional digital sensors

Door switch: to detect the status of the door of the HPU enclosure. It generates a Warning if door is open

Handpump selector sw: if the handpump switch is ON, the electrical pumps are blocked.

Pneumatic micro-sw: special application (only on request)

PST mechanical sw: special application (only on request) **Piston posit sw low:** available only in case of pump control by volume loss. It generate

Piston posit sw low-low: available only in case of pump control by volume loss. It generates alarm and pump block

3.7 Remote signalling

The standard ITVC has:

- 1 Monitor relay: single side stable, voltage free SPDT contact, it summarizes the alarm conditions.
- 4 latching output relays, voltage free, SPST contact, available in the ITVC module. The condition to switch of each relay can be set by the configuration options, see "SETUP, Administrator menu, Change password and Relay options" procedure.

2 additional relays are available in the **HPU control module**:

• 2 single side stable output relays, voltage free, SPDT contact. The condition to switch of each relay can be set by the configuration options, see "SETUP, Administrator menu, Power HPU, Relay" menu.

3.8 Local signalling

The list of the **Alarms** and **Warnings** is available in the paragraph **ITVC-HPU Troubleshooting**. The Alarm / Warning can be locally viewed by the procedure described in the IOM-ITVC-Basic, paragraph "**Visualization of Alarms and Warnings**". Historical data can be viewed in Measurement menu.

Warning: the ITVC-HPU does not perform any action, it only raises the local signalling of warning by the icon $\angle \underline{}$ and by the fuchsia LED of pushbutton $\angle \underline{}$.

Alarm: the alarm condition is locally signalled by the icon (\underline{A}) and by the red LED of pushbutton (\underline{A}) .



4 HPU options in the ITVC HMI

The procedures to navigate in the ITVC HMI described in the manual "**IOM-ITVC-Basic**", are valid also for the **ITVC-HPU**. The only difference is in **HOME** page that is **HPU type**. The navigation rules and icons of display are the same.

The present chapter reports only the procedures relevant to setting of **HPU control module**, refer to **IOM-ITVC-Basic** and **Annex A, B, etc.** to find the instruction of the other functions (Visualization of Alarm and Warning, Actuator control mode, Measurement, Language, PST function, Line Break function, Measurement, Language, etc.). Here below are reported only the **MENU** and **SETUP charts**, modified with **HOME** page **type HPU**. The historical and instantaneous measures relevant to HPU are available in the **Measurement** menu (see IOM-ITVC-Basic).

4.1 MENU chart



DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it SHEET 10 DI 22



4.2 SETUP chart



The "**Power HPU**" option of the **SETUP**, **Administrator menu** contains the procedure to set the **HPU control module** (I/O's, working pressure, pump redundancy, alarm and warnings, out relays, etc.)





4.2.1 Power HPU options

The below figures shows the procedure to enter in the "**Power HPU**" menu from Administrator menu. The options "**Coil test**" and "**HPU Shell**" are used in special applications and are not described in this manual.

The below figures show the procedure to set the following options in the Power HPU menu.

• Number of engines:

•

•

.

1 (single pump) or 2 (pump redundancy)

it sets the voltage working range of HPU

if the HPU is fitted with oil turbidity sensor

- the range must be smaller than Min-Max alarm pressure range
- the range must be larger than Min-Max working pressure range
- Min oil level if the HPU is fitted with level transmitter
- Min-Max alarm voltage
- Warning-Alarm oil turbidity

Min-Max alarm pressure

Min-Max working pressure

Power HPU menu 16:59:59 21-04-2014 Motor pump number 16:59:03 21-04-2014 Power HPU menu Engines power HPU Number of engines By And V select 1 or 2 and Working press 2 Alarm press then press Min oil level Alarm voltage Oil turbidity Analog inputs Digital inp 16:59:59 21-04-2014 **HPU** working pressures Accum calibration Working pressure HPU Coil test Minimum pressure ₄ Phase uni Mode 185.0 bar Exchange engines Max recharge time Maximum pressure By ≈ and ≥ select the Max motor current 195.0 bar **HPU Shell** character and then press Working t to enter it and switch to the next Working oil temperatur 16:59:59 21-04-2014 one Alarm pressure HPU 4 Minimum pressure To/From previous 100.0 bar **HPU** alarm pressures page of MENU, Maximum pressure Administrator 200.0 bar menu 16:59:59 21-04-2014 Min oil level Minimum level ┛ **HPU min oil level** 05 % To select an option: by A and Solution the cursor on the selected option and then 16:59:59 21-04-2014 press 🚽 **HPU voltage alarms** Voltage alarms Minimum voltage alarm ▰ 16:59:59 21-04-2014 To switch back to previous page 300 of menu: press simultaneously Maximum voltage alarm Confirm ★ ✓ or position the cursor ► 450 on 🔶 and then press 🔶 YES NO 21-04-2014 16:59:59 Oil turbidity (ISO) Warning turbidity ▰ By And Select YES 00.0 and then press Alarm turbidity **HPU oil turbidity** 00.0



The following figure allows setting the **analogue** and **digital sensors of HPU** connected to **HPU control module**. Settings should be according to **HPU electrical scheme** and is done **by the manufacturer**. The following parameters can be set:

• 4-20 mA analogue inputs: type of sensor, present/not present, value in engineering units at 4 mA and 20 mA

• **Digital inputs:** type of switch, present/not present, channel number, normally open/normally closed.

The figure shows the procedure to set one analogue and one digital channel. The procedure is the same for all channels. A similar procedure is available in the Administrator menu for the analogue and digital inputs of the ITVC module.





The following figure shows the procedures "Exchange engines" and "Relays.

- Exchange engine:
- Automatic = 🗉 : the HPU should have **2 pumps**. They are exchanged in case of alarm or if the configured time is passed. If "Automatic"= 🗆 (Manual mode), only the pump selected by "Active engine" works
- Active engine:
- The operator selects the pump to use as master (1 or 2). The ITVC-HPU controls the selected pump. In "automatic" it switches to the other one in case of alarm or if the configured time is passed.
- **Relays** (output relays on the **HPU control module**): it allows setting the condition to switch-over the relay (motor 1&2 running, motor 1 running, motor 2 running, heater, not used) and the action of relay (energized/de-energized)





The below figure shows the procedure to set the following Power HPU options

- **Phase unbalance**: set the maximum allowable current difference between the phases of the active electrical motor
- Mode: type of HPU electrical power: not present, single phase, three-phase, direct current
- Max recharge time: max allowable time to reach the specified working pressure
- Max motor current: max allowable current of each phase of active motor
- Working temperature: min and max working temperature of electronics of HPU control module
- Working oil temperature: min and max, if HPU has analogue transmitter of oil temperature





The below figure shows the option "Accum charge calibration" to set the accumulator parameters and the calibration routine to evaluate the total available number of strokes by the pressurized oil of accumulator.

Parameters:Precharge pressure: accumulator precharge pressure,Min pressure: minimum workingpressure with accumulated oil,Min temperature: minimum accumulator working temperature,Maxtemperature:maximum accumulator working temperature,Precharge temperature: accumulator prechargetemperature,Alarm strokes: minimum number of strokes

Calibration: "Available stroke calcula" page. If the actuator is **open** and the selection is "Present" the calibration routine starts and is performed step by step. Respond by \checkmark to the query of the display to initiate the next step.



DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dygautomation.it www.dygautomation.it SHEET 16 DI 22



5 ITVC-HPU Troubleshooting



In addition to the alarms listed in the paragraph TROUBLESHOOTING of manual **IOM-ITVC-Basic**, the tables below show the **Alarms**, and **Warnings** generated by the **HPU control module**.

ITVC signals the presence of an Alarm remotely by the **Monitor relay** and locally by the icon \bigtriangleup in the **HOME** page. The LED of pushbutton \bigstar lights-up red colour. In case of warning the display shows the icon \bigtriangleup and the LED of pushbutton \bigstar lights-up, fuchsia colour.

Use the procedure described in the paragraph "Visualization of Alarms and Warnings" of document "IOM-ITVC-Basic" to view the current alarms and warnings.

The tables below show the potential causes of the alarm and warning and the action to do to solve the problem.

ALARM table

Alarm displayed	Potential cause	Action
TEMP SENSOR FAIL	EMP SENSOR FAIL Failure of external temperature sensor. (only with HPU control module)	
LEVEL SENSOR FAIL	Failure of oil level sensor	Check oil level sensor and connections
PUMP FAULT	Oil pressure not reaches the working pressure in the configured time (case of 1 only pump)	Check HPU pump Check leakages
PRES SWITCH HPU	RES SWITCH HPU Pressure switch ON	
OIL TEMP HPU	OIL TEMP HPU Oil temperature switch ON	
HIGH PRES HPU SHELL	Oil pressure limit exceeded (by analogue transmitter)	Check pumps, relief valves, etc.
LOW PRES HPU SHELL	Oil pressure lower than low limit (by analogue transmitter)	Check pumps and hydraulic tubing
ABNORM PRES HPU SHELL	Oil pressure decreases even if pumps are ON	Check pumps and hydraulic tubing
HIGH HPU OIL TEMP	High oil temperature (by pressure switch)	Reduce working time of pumps
LOW PRES NOTROGEN	Low nitrogen pressure (by pressure switch)	Check nitrogen accumulator and recharge it
HIGH HPU PRESSURE	High oil pressure of HPU	Check HPU
LOW HPU PRESSURE	Low oil pressure of HPU	Check HPU
LOW HPU VOLTAGE	Low voltage of HPU electric motor	Check power supply of HPU
HIGH HPU VOLTAGE	High voltage of HPU electric motor	Check power supply of HPU
LOW OIL LEVEL	Low oil level in HPU reservoir	Check HPU for leakages Fill tank with appropriate oil
PUMP 1 FAULT	Oil of HPU not reaches the working pressure in the	Check HPU pump
Temi TIMell	configured time	Check HPU for leakages
MAGNETO HPU	External magnetothermic switch intervention due to motor overcurrent (if present)	Check HPU motor
OVERVOLTAGE 5VA	HPU control module failure	Reset alarm. If it persists, replace ITVC-HPU
UNDERVOLTAGE 5VA	HPU control module failure	Reset alarm. If it persists, replace ITVC-HPU
OVERVOLTAGE 3.3V	HPU control module failure	Reset alarm. If it persists, replace ITVC-HPU
UNDERVOLTAGE 3.3V	HPU control module failure	Reset alarm. If it persists, replace ITVC-HPU
OVERVOLTAGE 15V	HPU control module failure	Check power supply Reset alarm. If it persists, replace ITVC-HPU
UNDERVOLTAGE 15V HPU control module failure		Check power supply Reset alarm. If it persists, replace ITVC-HPU
CONTACTOR 1	HPU control module failure	Reset alarm. If it persists, replace HPU control module
CONTACTOR 2	ONTACTOR 2 HPU control module failure	
PUMP 2 FAULT	UMP 2 FAULT HPU not reaches the working pressure in the configured time	
HPU NOT PRESENT	Communication link failure between ITVC and HPU control module	Reset alarm. If it persists, replace ITVC-HPU



Alarm displayed	Potential cause	Action
3.3VA POWER HPU	HPU control module failure	Reset alarm. If it persists, replace HPU control module
5VA POWER HPU	HPU control module failure	Reset alarm. If it persists, replace HPU control module
5VC POWER HPU	WC POWER HPU HPU control module failure	
24VI POWER HPU	VI POWER HPU HPU control module failure	
HIGH MOTOR ABS	Current of electric motor exceeds the limits	Check electric motor of HPU
PHASE UNBALANCE	Phase unbalance of ITVC-HPU power supply	Check power supply
LOW VOLTAGE HPU	Low AC voltage of ITVC-HPU power supply	Check power supply
HIGH MOTOR 1 ABS	Current of electric motor No.1 exceeds the limits	Check electric motor 1 of HPU
HIGH MOTOR 2 ABS	Current of electric motor No.2 exceeds the limits	Check electric motor 2 of HPU
OIL TURBIDITY	DIL TURBIDITY Hydraulic fluid turbidity exceeds the limit	
NO PHASE	Loss of phase of ITVC-HPU power supply (3-ph)	Check power supply
HIGH VOLTAGE HPU	High AC voltage on HPU power supply	Check power supply
PRES SENSOR HPU	HPU pressure sensor failure	Check HPU pressure sensor
OIL TURB SENS	HPU oil turbidity sensor failure	Check HPU pressure sensor
MIN AVAIL STROKES	Pressurized oil in the accumulator is not enough to perform the configured minimum number of strokes	Check HPU and accumulator
MAX HPU TIME	MAX HPU TIME HPU not reaches the working pressure in the configured time measured after pump start	
MIN MOT VOLTAGE	Low DC voltage of ITVC-HPU power supply	Check power supply
HPU MODE ERROR	Communication link failure between (ITVC and HPU control module)	Reset alarm. If alarm persists, replace ITVC- HPU
3.3V POWER HPU	HPU control module failure	Replace HPU control module
24V_IN POWER HPU	HPU control module failure	Replace HPU control module
HIGH EXT TEMP HPU	External (ambient) temperature higher than configured limit	Solve the problem and restart
LOW EXT TEMP HPU	DW EXT TEMP HPU External (ambient) temperature lower than configured limit	
HIGH PCB TEMP HPU	HIGH PCB TEMP HPU Temperature of electronics of HPU control module higher than configured limit	
LOW PCB TEMP HPU	Temperature of electronics of HPU control module lower than configured limit	Solve the problem and restart
OIL TEMP FAIL	Oil temperature transmitter failure	Check transmitter and connections
HIGH OIL TEMP	IIGH OIL TEMP Oil temperature higher than configured limit	
LOW OIL TEMP	_OW OIL TEMP Oil temperature lower than configured limit	
PISTON POS LOW LOW	STON POS LOW LOW Position switch "Low-Low" on	
MOTOR PROTECTOR 1	IOTOR PROTECTOR 1 High temperature of pump 1 motor	
MOTOR PROTECTOR 2	OTOR PROTECTOR 2 High temperature of pump 2 motor	
MANUAL SELECTOR	Hand-pump selector in manual (if present)	Switch the selector in automatic
HPU PRES MAX High pressure of HPU (INVERTER MAX PRESSURE)		Check HPU
HPU PRES MIN	Low pressure of HPU (INVERTER MIN PRESSURE)	Check HPU
1		

WARNING table

Warning displayed Potential cause		Action
OIL TURBIDITY	Max oil turbidity exceeded (warning limit)	Check oil of HPU and change it
UNIT DOOR	Door of HPU cabinet is open (Door switch is on)	Close door of HPU cabinet
LIMITED STROKES	Pressurized oil in the accumulator is not enough to perform the minimum No. of strokes (warning limit)	Check HPU and accumulator
UNBAL PHASE M1	Phase unbalance of motor 1 of HPU (warning limit)	Check power supply
UNBAL PHASE M2	Phase unbalance of motor 2 of HPU (warning limit)	Check power supply
HIGH MOT VOLT	High voltage of motor of HPU (warning limit)	Check power supply

DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it SHEET 18 DI 22



6 Installation



In addition to instruction present in the chapter "INSTALLATION" of IOM-ITVC-Basic, the following instruction should be carefully read. If ITVC is fitted with battery pack see also paragraph "Battery option" in the Annex B.

6.1 Safety recommendation

Isolate before opening, do not open any ITVC-HPU covers without being sure that supply voltage has been switched off.

The ITVC-HPU MUST be connected to the voltage supply through a magneto-thermic switch. It should be sized considering the total power requested by the electrical motors and by the ITVC-HPU (<45W depending on the configuration). It should have a tripping curve (in general curve D) suitable for the starting current of motors.

DVG reserves the right to advise different sizes of circuit breakers based on the configuration of the systems to be controlled. This information will be recorded on the wiring diagrams supplied with the apparatus.

Even if the ITVC-HPU is equipped with an on-board main switch, nevertheless it is mandatory that the user install a main switch to isolate the ITVC-HPU main power terminals

DO NOT OPEN the covers in hazardous area (i.e. in presence of explosive atmosphere).

The Isolation/Protection devices (magneto-thermal switches, fuses etc.) should be provided on the plant at Customer care. They should be

- In accordance with the Local National Standards and plant rules
- Suitable located and easy to reach
- Properly marked to identify the disconnecting device
- Not interrupt the protective earth connector

The output relays contacts R1,...R4, MR, in the "ITVC user terminal block", R5, R6 in the "HPU control module terminal block" are pure voltage free contacts. If these contacts are supplied by an external voltage (110-230Vac, etc.), it is at customer care to install fuses (or any voltage/current protections) in the marshalling cabinets of control room.

Any voltage should be **isolated** before opening the ITVC-HPU enclosures.

6.2 ITVC-HPU Weight and Measurements



Total weight of the ITVC-HPU, aluminium alloy enclosure, is 17 + 14= 31 Kg.

Total weight of the ITVC-HPU, SS 316L (cast CF3M) enclosure, is 46.5 + 38.5 = 85 Kg.

Total height (with ON-OFF switch) 146+5 = 151

DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it SHEET 19 DI 22



6.3 Cables and terminal blocks



7 Maintenance and Cleaning



The ITVC-HPU is an electronic device enclosed in a weatherproof and explosion-proof housing, and does not require any particular maintenance. Also, there are not any special requirements regarding cleaning.

8 Decommissioning



Refer to IOM-ITVC-Basic. The same procedure is valid for the HPU Control Module

9 Nameplates



Two additional nameplates are on the HPU Control Module. Refer to IOM-ITVC-Basic to see the nameplates



10 ITVC-HPU start-up



The following checks should be added to the procedures described in the chapter START-UP of the document **IOM-ITVC-Basic**.

Before powering the ITVC-HPU the following check should be done:

- Temperature: it should be correct for the installation and according to the value indicated in the label on the ITVC and HPU control modules enclosure
- Main supply voltage: it should be correct for the installation and according to the attached electrical diagram and the label on the ITVC and HPU control module enclosure.
- Wiring and electrical connections: they should be according to the electrical diagram.
- Actuator: the mechanical stop of the actuator should be already set and the actuator should be in its safe position. Check the hydraulic connection to the HPU and SOV's. Use the IOM's of the actuator to perform this checks.
- HPU: check if it was assembled according to instructions supplied with the HPU and tubing and connection are well done. Check if oil in the reservoir and nitrogen in the accumulator are present. The selector of handpump (if present) should be in automatic (remote). All mechanical tests and preliminary operations must be completed before electrically powering the unit, see HPU instruction manuals.

Power on the ITVC-HPU. Switch on the main power switch of the HPU control module

- Check that the **HOME** page is as described in the previous paragraphs. Set LOCAL actuator control mode (see IOM-ITVC-Basic)
- The ITVC-HPU is configured in factory. No further configuration is requested
- If the HPU is equipped with hand-pump check that the Local selector is in Automatic.
- Check pressure, level, temperature, position, alarms and warnings, etc. by the procedures described in the previous paragraphs and in the **IOM-ITVC-Basic.**
- If used, check the 4-20mA outputs and in case recalibrate them. The procedure is described in the previous paragraphs **IOM-ITVC-Basic**.
- When pressure is OK, drive the actuator in opening and closing. Perform the setting of the actuator as described in the Start-up procedure of **IOM-ITVC-Basic**.
- Perform accumulator calibration procedure



WARRANTY

DVG Automation S.p.a. products are warranted to be free from defects in materials and workmanship for a period of eighteen months from the date of delivery (unless otherwise agreed when ordering) if they are used according to DVG Automation S.p.a. recommended usages. DVG Automation S.p.a.'s liability is limited to the repair, purchase price refund, or replacement in kind, at DVG Automation S.p.a.'s sole option, of any products proved defective. DVG Automation S.p.a. reserves the right to discontinue manufacture of any products or change products materials, designs or specifications without notice.

Note: DVG Automation S.p.a. does not assume responsibility for the selection, use and/or maintenance of any product. Responsibility for proper selection, use and maintenance of any DVG Automation S.p.a. product remains solely with the purchaser and end user.

Trade Marks:

DVG AUTOMATION has used all reasonable resources and efforts to indicate and supply information regarding Registered Trade Marks[®] and Trade Marks[™] used in this document.

The absence of a Registered Trade Mark[®] or a Trade Marks^m identifier does not mean that a given word or technology is not a Registered Trade Mark[®] of a Trade Mark^m.

We acknowledge that all Registered Trade Marks[®] or Trade Marks[™] mentioned in this document, either with or without identifier, are the property of their respective owners.

Upon advise that we have erroneously omitted to identify Registered Trade Marks[®] or Trade Marks[™], we will rectify the next edition of this document.



HQ:I-29016 Cortemaggiore (PC), via G. Rossetti, 2 REA Nr 167410/ VAT Nr 01494460338 <u>www.dvgautomation.it</u> <u>info@dvgautomation.it</u> Tel. (+39) 0523 255811 Fax (+39) 0523 255890

DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it SHEET 22 DI 22